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Adoption and Use of Web Technologies by Librarians in Open Distance e-Learning at the University in South Africa

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Abstract

Web technologies are now adopted by libraries worldwide to facilitate information services. The objective of this study was to examine how subject librarians' use web technologies to support students in an online, distance and e-learning university in South Africa. Data was collected from 68 of the 135 participants who were administered with an online questionnaire, and analysed to generate information about web technology adopter categories and examine the types of the web technologies used by the librarians. Technical support and network issues top the challenges the librarians encountered. The librarians recognise the pertinence of web technologies in their services but their performance is hampered by technology, administrative and environmental factors. There is need to practically examine the meaning and nature of library technical support in the library, and extent of performance of existing library technical support services based on the opinion and experiences of UNISA librarians.

Introduction and Literature Insight

Libraries are technology intensive-institutions, and libraries today use technologies to solve nearly every problem in the library. The roles of the library always require urgency as library clients need timely information to meet their information needs; this is why the new technology is always suggested as a strategy to address the need for efficient library services. However, Connaway *et al.,* (2008) have observed that "It is difficult to change libraries as quickly as other technology-based information providers because library systems and services constructed around them have been in place (and deeply ingrained) for centuries". Johnson and Magusin (2005) recast this observation by stating that librarians were early adopters of computers but that libraries are often the last place to update technology once the technology has been adopted by the library. Blackburn (2011) was point blank when he stated that "Librarians are simultaneously the first and last to consider implementing new technologies into their programmes". A major explanation of this dilemma is that libraries serve various constituencies that have differing information-seeking and needs and habits (Sommers 2005). However, a new generation of librarians has entered the workforce; they are compelled to adopt a technologically oriented work style, adopting and using technologies to serve clients' information.

Web technologies are a new trend in the library and information sector, and their rapid uptake presents both opportunities and challenges. Web technologies consist of mechanisms that allow two or more computer devices to communicate over a network. They enable individuals to communicate and share information using various web applications available in the Internet (van Jaarsveldt and Wessels 2011). Web technologies orchestrate new information

service demand, and libraries are compelled to diversify their information technology applications and capacity to the growing information need. The strategies to manage the interaction between the library and the library clients have dramatically changed, and librarians are facing a different kind of *clientele* who are expecting services to be offered using recent web platforms, in addition to the traditional print-based services. In the new web era, librarians and library clients are increasingly active part of the virtual community who contribute to the content the libraries offer to them (Kumar and Tripathi 2010).

University of South Africa (Unisa) Library is one of the largest academic libraries in Africa, with huge collections in both print and electronic formats. The library has three branches, with its biggest branch situated in Pretoria *(University of South Africa, 2018).* Technology utilisation in the Unisa library is based on Unisa's Open Distance and e-Learning (ODeL) model, where services that were normally offered on face-to-face basis are now offered online. In this model, the entire institution's transactional environment with students is fully digitised, with projected robust, effective, and integrated ICT applications (Unisa Policy 2012). The expansion of electronic resources is in line with the strategic plan of the university focused on driving the university into a complete Online, Distance and e-Learning (ODeL) institution. It is within this complex environment that Unisa librarians labour to meet the information needs of both students and staff of the institution dispersed across the world.

Modern library system is designed to ensure efficient information service delivery using information technology (Zongozzi 2021). The Unisa library system is designed to ensure efficient information service delivery using information technology. In such interaction, the web technologies play a big role by offering libraries and librarians' worldwide platforms where clients interact with each other and contribute to the content they offer, and other. Web technologies in the library embrace social networking tools, collaboration tools and social bookmarking tools, among others, used via the Internet. The web technology tools afford interactivity as central essence of participation. In the case of an Open, Distance e-Learning university, the users, technology and tools, library and its services must be integrated in such a seamless manner as to achieve required information service delivery, and the librarian is the key operator of the library with support staff. This brings the concepts of acceptance, adoption and use of the technologies into focus. These concepts posit that technology acceptance, adoption and consequent use are events that are laced with several social and other factors, and that understanding these factors are very critical in efficient service delivery (Zongozzi 2021).

Web technology utilisation, benefits and the challenges they pose have been studied, informing about how libraries, and librarians in particular are affected by the changes brought by newer or emerging technologies (Hayman and Smith 2015). Librarians have to continuously evolve with the changes, not only as people who need to know but as educators. Kenefick and Werner (2008) and Gregory (2009) have discussed librarians as people whom, despite facing all changes and challenges caused by technology in their jobs still show commitment and perseverance to serving library clients. Kim and Abbas (2010) explored different functionalities of web applications by indicating which applications are user-initiated and which ones are librarian-initiated. They further addressed social media applications used for social interaction such as Twitter, Facebook, Wikis and Blogs.

These applications enhance collaboration and sharing of scientific research contribution by researchers, students and librarians. Boateng and Liu (2014) analysed more than 100 top university libraries in the United States (US) focusing on the usage, trends and adoption of web tools. Boateng and Liu (2014) present aspects they termed checkpoints. Baro, Idiodi and Godfrey (2012) discuss the level of awareness about web tools in Nigerian libraries and the purpose of implementing particular applications/ tools. They also explored the ways librarians acquire the skills for introducing web applications as well as barriers that they encounter when they implement such applications. A comparative study by Baro, Ebiagbe and Godfrey (2013) analysed the implementation dynamics of web technology tools in South Africa and Nigeria academic libraries. They found that Facebook was the most frequently used social network by librarians,

Libraries implement web technologies based on the functions that need to be accomplished in the

library (Sahai and Graupner 2005). The major web technologies that apply in the libraries today can be categorised into four namely social media tools, social bookmarking tools, training and video conferencing tools, and, research management/citation management tools.

(i) *Social media tools*

Social media is useful in empowering library clients. The following components are very critical in library services: Twitter, Facebook, Blogs, Wikis and Really simple syndication feeds (RSS feeds).

(ii) *Social bookmarking tools*

Social bookmarking is an online service which allows users to add, annotate, edit, and share bookmarks of web documents. These include: Academia.edu, Diigo *(Digest of Internet Information, Groups and Other Stuff),*

(iii) *Training/Video conferencing tools*

These are technologies that facilitate training and video engagements. They include Podcasts, Skype

(iv) *Research management/Citation management tools*

These are tools used by researchers and students to manage, store and organise citations and bibliographies in their research works. Citation management tools existed for years, for instance, on desktop format until recently when they have been made available on the web platform. Some of the tools are Refworks, Mendeley, Researchgate, Altmetrics and Libguides.

Research on the acceptance and adoption of library technology is not as common and well researched as acceptance of technology in the information systems or in information technology sector. This sentiment is shared by Hong, Thong and Wong (2002) when they say that the traditional focus of digital library research has been on the technological development, and that there is now to focus research on various users. The user focus idea is necessary, because the development of technology does not guarantee usage, availability and sustenance in usage. Specifically in the case of the library, there is a tendency to neglect the fact that librarians are also users of the technology. Theories of technology acceptance as pioneered by Davis (1985) and further developed by Venkatesh (2003), Davis; Baggozzi and Warsaw (1989) offer this study usable constructs to understand issues driving librarians to use or reject web technologies.

Statement of the Problem

Library and information services provisioning at Unisa will confront unique social and technical issues and challenges. Basically, clients served by this library are not co-located (Dugan 1997). The world wide web, and in particular web technology tools are potential solutions to bridging the distance between librarians and the clients in an ODeL context. The flexibility offered by web applications in enhancing clients' interaction with librarians, collaboration with other library clients and participating in improving library services and collection are more apparent in an ODeL institution. Social aspects of implementing web technology applications in the library are important because, understanding them will enable librarians to make informed choices. Abdekhoda and Dibaj (2011) analysed the familiarity of medical librarians to web technology applications and their results support the importance of understanding librarians' acceptance, adoption and use patterns.

Familiarity to web technologies help librarians deliver better information services. Acceptance, adoption, competence and enthusiasm are some of the drivers for librarians when choosing to use specific web applications. Informed knowledge about what kind of applications are suitable for a specific group of clients, and for which specific library tasks they are relevant, are further more crucial factors in the usage and/or non-usage of that tool by the clients. Unisa has continuously expanded web technology applications in its library services but evidence about librarians' acceptance and adoption of these technologies by librarians does not exist, whereas such knowledge is required to improve the performance of the librarians in information service delivery. Many studies have debated web tools from the library perspective, but not necessarily within the context of ODeL or residential university. Key issues in the implementation of web technologies in the library in an ODeL context must be examined to

ensure that the technologies are achieving expected goals. Librarians are users of technologies and they encounter challenges in adjusting to the use of the technologies, but their encounters and challenges are really never considered serious issues to be examined.

Purpose of the study

The aim of the study was to examine the acceptance and adoption and use of web technologies by librarians in an open, distance e-learning university in South Africa.

Theoretical Framework

The study is guided by two theories: Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI).

Diffusion of Innovation Theory

Diffusion of innovation is concerned with how innovation spreads or gets acceptance from society after some period. It is attributed to Rogers (1962). Innovation can be defined as a specific idea, practice, or object that is perceived as new by an individual or another unit of adoption (Rogers 1995). In DOI theory, the time that an innovation takes to diffuse in an organisation or in a society is very crucial. The elements of diffusion of innovation are: innovations, adopters, communication channel, time and social systems. An innovation is characterised by attributes such as:

(i) Relative advantage – the advantage that the user gains by using the newer innovation in comparison with what he/ she is familiar with.

(ii) Compatibility – how the new innovation fits in with the task at hand.

(iii) Complexity – how easy or complicated the innovation is to the potential adopters

(iv) Trialability – the ease with which the newer innovation can be tested in similar situations before the actual implementation.

(v) Observability – the ease with which a particular innovation can be observed among other innovations.

Rogers (1962) categorised individual adopters as innovators, early adopters, early majority, late majority and the Laggards. The categorisation of individuals is necessary because it shows how their varying degrees of adoption motivation and potential (Khan and Wooseley, 2011).

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was pioneered by Davis (1985). TAM theorises that an individual's behavioural intention to use a system is determined by two beliefs which are: perceived usefulness and perceived ease of use (Venkatesh and Davis 2000). These two variables along with the behavioural intention of an individual who has a positive attitude determines the actual usage of the system. Perceived Usefulness is defined as the degree to which an individual believes that using a particular system would enhance his or her job performance (Davis, 1985) and (Venkatesh and Davis, 2000).

Integration of TAM and DOI Variables

The constructs in Technology Acceptance model and Diffusion of Innovations theories can work together in a particular e-learning situation. There is vast amount of literature studying each of these theories and applying them in various settings with great success. At closer examination however, the two models have variables that are overlapping. Lee, Hsieh and Hsu (2011) contributed a pioneering study that integrated the variables in both the TAM and DOI theories in studying the usage patterns and adoption of e-learning systems. They found that the relative advantage variable in DOI is almost similar to the perceived usefulness in TAM, whilst the complexity variable is also similar to perceived ease of use. Khan and Woosley (2011) analyse variables that are useful in studying the TAM and DOI. Lee *et al* (2011) blended them and indicated that the TAM and DOI are similar in some constructs and complement each other to examine the adoption of IS/ IT. Abdekhoda and Dibaj's (2016) linked the constructs of DOI focusing on organisational adoption dynamics with the TAM constructs focusing on individual acceptance dynamics (Fig 1), an approach that was adopted in this study.

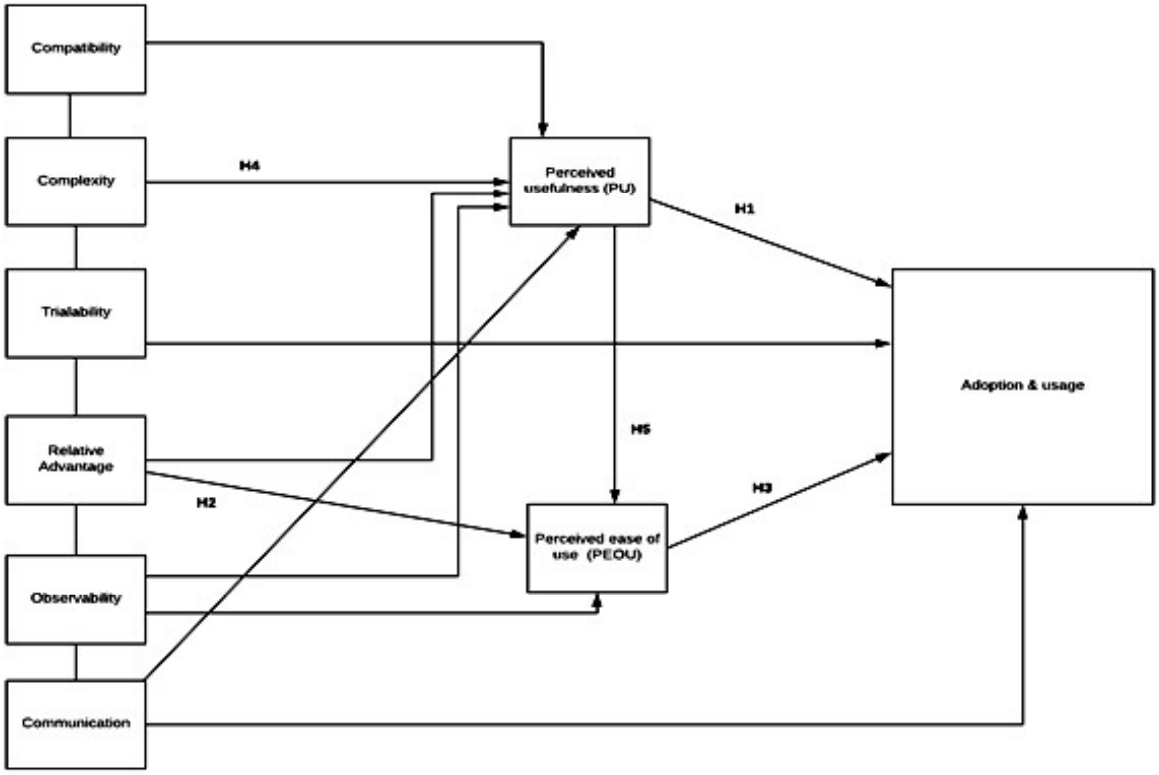

Figure 1: Conceptual research path model for web technology usage and adoption at Unisa library

A combination of TAM and DOI provides a lens for understanding the different factors that influence librarians' decision to use, or not use, an innovation, and when in the product lifecycle they might adopt. Characterising the adoption of contemporary information services, such as digital oriented library services, however, is more complex than many other situations. Individuals' self-perception of their ability to use technology and their ability to judge whether a technology has utility for them are important factors for understanding technology adoption behaviours.

Hypotheses

The hypotheses focussed on the variables selected from TAM and DOI theories. The hypotheses are as follows:

$H_0$1. The perceived usefulness of web technology tools by librarians at the UNISA library will positively lead to adoption of the tools for library services.

$H_0$2. The perceived usefulness of the web tools by librarians at the UNISA library will significantly depend on the relative advantage the librarians expect to gain when using such the tools.

$H_0$3. The perceived ease of use of a web tools by librarians at the UNISA library will significantly influence the acceptance and adoption.

$H_0$4. The perceived complexity of library web technology tools by librarians at the UNISA library will have a significant influence on the perceived usefulness of the tools.

$H_0$5. The perceived usefulness of library web technologies by Unisa librarians will significantly depend on the ease of use of the tools.

Methodology

The study was conducted at the University of South Africa (Unisa) Library. Unisa Library has three (3) subject branches, which are Muckleneuk library in Pretoria, School of Business Leadership Library in Midrand and the Science Campus library in Florida, Johannesburg. There are smaller regional libraries located in various cities and small towns throughout South Africa with one located in Addis Ababa in Ethiopia. The location of the students they serve is, however, global. Owning to the significantly high

number of students in remote locations and the geographical disparity of librarians versus students, the utilisation of web technology tools is inevitable. With these tools, clients are able to utilise the services without travelling to face the librarian.

The study was carried out using a descriptive, quantitative sample survey design. The target population consists of 255 Unisa Library staff. The target population has different characteristics in terms of their social demographic characteristics, experiences and technology use capacity crucial to portray different web usage experiences. The researchers obtained the details of the librarians from Unisa Human Resources Department. A solicitation letter was sent to the 255 library staff explaining the details of the study and appealing for their participation. A total of 135 accepted to take part in the study.

A questionnaire containing closed and open ended questions was used to collect the data. The instrument contained demographic characteristics including sex, age, and work experience; technology adopter categories: innovators, early adopters, early majority. The study also examined the web technology tools already adopted by the librarians measured by frequency distribution of listed tools, and challenges encountered using the web tools. Furthermore, the study investigated the factors librarians perceived as influencers of their adoption of web technologies. On a five-point Likert scale from 1= strongly agreed to 5 = strongly disagreed, we investigated the DOI/TAM variables as shown in table 1.

Table 1: TAM/DOI variables in the study

Constructs	Variables
Perceived usefulness	Applying web technology tools in my job enables me to accomplish tasks more quickly
	Applying web technology tools improves my job performance
Perceived ease of use	Interacting with library clients using web technology tools is always easy
	Learning to use web technology tools to assist clients in my library is easy for me
	Using web technology tools to offer library remote training make a librarian's job easier
Relative advantage	The web technology tools I use to assist Unisa clients give me a relative advantage over my peers who do not want to use them
	Adopting web technology tools in Unisa library may improve the quality of my work
Compatibility	Using web technology tools is compatible with all aspects of my work
	Web technologies I use are consistent with my existing values and needs
Complexity	Web technology innovations are complex to use
	Using web technology tools for library clients is often frustrating
	Using web technology tools to support library clients need a lot of mental effort
Trilability	There are enough people in my organisation to help me try the various uses of web tools
	There are enough people in my organisation to help me try the various uses of web tools
Observability	I have seen what other librarians can achieve by using web technology tools in their libraries
	The benefits of using web technology tools are visible to remote library clients
	The benefits of using web technology tools are visible to remote library clients
	Using web technology tools has enhanced my status at Unisa library
Communication	I use communication tools (Skype, Scopia, Live broadcasts, etc) to train remote library clients
	I use Interpersonal communication tools (such as Skype, Scopia, Live broadcasts, etc.) to communicate with remote library clients

In an open-ended manner, the researchers asked the respondents to supply any comments about their experiences in the use web of technology tools questions. The researcher adapted questions used in Abdekhoda et al (2013), Khan and Woosley (2011), and Chuttur (2009) to understand acceptance and adoption behaviours of the respondents. The instrument was administered using Survey Monkey, because participants were located in various regions throughout South Africa and in one regional library in Ethiopia, Addis Ababa, and they are web-literate enough to complete the instruments.

The questionnaire was sent to the 135 librarians who had earlier consented to participate in the study, and five reminders were sent over a period of five months. However, only 68 of the 135 participants completed the instrument, a low rate of 50.3%. The reliability of the scales was tested using Cronbach-alpha coefficient to measure the internal consistency of the instrument. The reliability of the scales ranged from 0.83 to 0.86, a result that shows that the scales were good for further analysis.

Chi-square was used to interrogate relationship between demographic variables and technology variables. TAM/DOI variables were computed to reduce their dimensions, and then used correlation analysis to analyse the relationships between the acceptance variables and technology adoption variables as they are specified in the hypotheses. In an open-ended manner, respondents were asked to provide comments about their experiences using web technologies to support staff and students putting the ODeL nature of the university into mind. In order to amplify the voices of the respondents, we deliberately displayed the opinions of some of the respondents to support the quantitative results.

Findings

Demographic Characteristics of Respondents

Gender distribution of the respondents was consisted of 68.18% females and 31.82% males. The age distribution shows a higher constitution of respondents aged 50 years and above (50%). It shows 19.12% of the age range 30-39 and 29.41%. The range of 20-29 years was the lowest at 1.47%. No respondent in the study was below the age of 20 years. In terms of their working experience at Unisa library: 8.82% of the respondents have 0-5 years working experience at Unisa. Less than half of respondents (42.65%) have worked in the Unisa Library for 6-10 years, while 39.71% have been employed for more than 20 years. The number of staff in the categories of 11-15 and 16-19 years are the lowest, 2.94% and 5.88% respectively.

Web Technologies Use at Unisa Library

Technology Adopter Categories

From Table 2, 37.31% of staff at Unisa Library are innovators of web technologies. The early adopters' category constitutes 7.4%, while the early majority are 35.82%. The result further shows that 5.97% and 11.94% of the respondents are in the late majority category.

Only 1.49% of respondents were laggards. We found no relationship between gender ($\div 2=4.189$, df=5, $p=0.421$), age ($\div 2=17.013$, df=15, $p=0.952$) and number of years of experience ($\div 2=26.082$, df=20, $p=0.680$) with the innovation categories.

Table 2: Web technology adopter categories at Unisa library

Questionnaire items	Adopter Categories	Frequency	Percentages
I usually want to be the first to try new web technology tools	Innovators	25	37.3
I always influence my colleagues to use web technology tools	Early adopters	5	7.4
I usually require some training by someone before using new web technology tools	Early majority	24	35.82
I usually need to see some evidence that web technology tools work before I use them	Late majority	8	11.94
I think the traditional way of working (without web technology tools) is still the best	Laggards	1	1.49
Missing records		***1***	6.05
TOTAL		68	100

Web Technology Tools Used in the Last Five Years

Table 3 shows that Facebook and Twitter were the most social media tools used, 66.18% and 41.18 %. In line with modern trends the way librarians support research, reference management tools (collaboration tools) such as Mendeley and RefWorks (58.82%) as well as ResearchGate (42.07%) were the most commonly used web tools. Web tools used for online training purposes like Podcasts (29.41%), Skype (30.88 %) and Scopia (39.71%) were also familiar with Unisa librarians. RSS feeds was also utilised by a high (54.14%) number respondents. Respondents also used social bookmarking tools. Diigo was used by 8.82% and Academia.edu was used by 25%.

Table 3: Types of web technology tools commonly adopted at Unisa library

Web technology	Frequency	Percentages
Facebook	45	66.18
Mendeley	40	58.82
RSS feeds	37	54.41
Research gate	29	42.65
Twitter	41	41.18
Scopia	27	39.71
ORCiD	24	35.29
Skype	21	30.88
Podcasts	20	29.41
Academia.edu	17	25.00
LibraryThing	8	11.76
Diigo	6	8.82
Join-me	2	2.94
WebEx	2	2.94
Other (please specify)	11	16.18

Note: Multiple response questions

The result of the open-ended responses shows 16.8 % of respondents specifying various web technologies such as Massive Open Online Courses (MOOCs) and Pinterest.

Challenges Encountered by Librarians when Using Web Technologies

In a yes-or-no manner, respondents were first asked whether they had encountered any challenges using web tools to assist online library users. Table 4 shows that as high as 76% of the respondents experienced various challenges when using web tools. The researcher listed challenges and asked respondents to indicate which ones applied to them. The result in Table 6 shows a high number of respondents (63.5%) reporting network issues and technical support respectively.

Table 4: Challenges encountered by librarians when using web technologies

Challenges of web technologies usage	Frequency	Percentages
Technical challenges	35	63.64
Network issues	35	63.64
Training requirements	30	54.55
Keeping up with new versions	21	38.18
Clients technology limitations	20	36.36
Security issues	19	34.55
Cost to implement	13	23.64
Complex to use	11	20.00
Privacy issues	8	14.55
Added stress for me	6	10.91
None of the above	2	3.64
Others (please specify)	8	14.55
Missing Records	*13*	*19.11*

Note: Multiple responses

A large number of respondents (54.55%) reported training need issues, while keeping up with new versions of web technologies is considered a challenge by 38.18% of respondents. Respondents also reported security issues (34.55%). The opinions in the open-ended section of the questionnaire shed more light:

"Colleagues' resistance to accept and adapt to new technology, as well as management's resistance to try out new technology."
"Poor library management support."
"Obtaining official approval to purchase licenses or to develop products in support of our information service - red tape. Slow and cumbersome tender process. Confusion of correct forms and procedure to follow, e.g. when submitting business specifications and requirements. Lack of clear written and accessible guidance from library/institution on procedural matters around technology."
"Lack of reliable and up to date information on clients' ownership of devices/level of access to the internet (e.g. continuous or reliant upon library/ telecentres, etc.) to inform decision-making."

Factors That Influence the Adoption of Web Technologies in Libraries

Table 5 presents respondents' responses to a multi-response questions on factors that contribute to librarians using web technologies.

Table 5: Factors that influence librarians to adopt web technologies

Factors that influence the adoption of web technologies	Frequencies	Percentages
Personal interest	37	55.22
Enhancement of communication with library clients	36	52.94
ODeL strategic objectives	34	50.00
Clients' expectations	32	47.06
Ease of training of remote library clients when one adopts web technology tools	27	39.71
It enhances the credibility of the library profession	21	30.88
It enhances my librarianship career	21	30.88
Other (please specify)	6	8.82

Note: Multiple response questions

The responses show that personal interest (55.22%), enhancement of communication with clients on the online platforms (32.94%), university's strategic ODeL objectives (50%) and clients' expectations (47.06%), contributing to influencing librarians to adopt web technologies. The ease of training of remote library clients is also reported by 39.71% as contributing factors to usage of web tools, whilst 30.88% of respondents reported that usage of these tools enhances their librarianship career. The comments in the open-ended section are very informative:

"Influencers within the Unisa Library (there are always colleagues with a passion for all things new and useful and they often raise the interest of others in trying something new), benchmarking what we do against other local and international institutions offering similar services. Necessity - anything widely used by clients or fellow professionals Inevitably makes its way into the operations of the Library, even if we adopt more slowly owing to budget constraints, staff shortages, discontinuity on ICT projects as the contracts of business analysts and other ICT staff expire and a new person has to take over and orientate to the project. Fear of being left behind. The next technology on the horizon is no longer in the singular – we face many new information technologies sitting just over the horizon, and not for long!"

"Makes my technological awareness easy. As a person working with technologies, one needs to always be on par with new technological developments."

Individuals Who Influence the Use of Web Technologies in Libraries

The questionnaire examined the influence of other individuals on the decision of the librarians to adopt. Table 6 shows that library colleagues (53.73%) and library clients (47.76%) were the most influencing individuals in the adoption decisions of librarians.

Table 6: Influencers of Unisa librarians to adopt web technologies

Individuals who influence respondents to use web technologies	Frequencies	Percentages
Library Colleagues	36	53.73
Library clients	32	47.76
Library Management	15	22.39
ICT colleagues	11	16.42
My boss	10	14.93
Other (please specify)	3	4.48
Missing record	*1*	

Note: Multiple response questions

Library management and participants' line managers were reported as influencers by 22.39% and 16.42% respectively. Colleagues in ICT were reported as influencing by 16.42% of the respondents, whereas 4.48% indicated that other reasons than those listed influenced adoption of the web tools.

Experiences of Librarians Using Web Technology – Open Ended Comments

The respondents offered very useful opinions. Some of the items in the opinions of Respondent 07 are very lucid points:

"Ethical, legal and online security issues are very important and should be investigated and handled up front before new web technology tools are adopted, and factored into any training offered to staff and students, and into interaction with staff and students. Even knowledgeable users are vulnerable when online."

"Accessibility issues for users living with disabilities should also be taken into account when selecting web technologies."

"A full, permanent team of ICT staff would help, including more people who specialise in educational technologies and the needs of clients living with disabilities."

"Liaison with the database vendors to consider the librarian as intermediary in the design of their databases - they should be friendly to both the self-help end user and the intermediary. All web technology tools would benefit from the input of librarians at the design phase. EBSCOhost has one of the most friendly and effective retrieval interfaces and it is because they have professional librarians working on the development team."

A respondent expressed concern about the current capacity of the librarians to meet the challenges of ICT needs in the Fourth Industrial Revolution. "41R is approaching. Unisa is supposed to be ODeL (institution) with remote learners and even in towns - poor internet connection; poor access to internet, cost of software and hardware (can make use of telecenters); librarians and clients not all techno - savvy; cost of data. Librarians need training and state of the art PC's and time and a place (studio) to experiment and create e.g. podcasts or screen casts. Library must budget for training and tools; technology (ICT) support. Not all students are using myUNISA and mylife e-mail - must be motivated to use it, they are not aware of its importance for communication".

"Even though web technology tools are assistive for the work it is difficult to use more often by end users in our branches as most of them said they have a problem of connectivity (Respondent 45). Many respondents focussed on ICT issues: "It takes too long to implement web technologies at Unisa and we constantly try and play catch-up. The approval and procurement processes hinder the adoption of web technology and by the time we implement, there is already something new and more exciting than the technology we just acquired" (Respondent 62). Others mentioned restrictions, awareness about new technologies, procurement bottlenecks, network challenges, and difficulty in loading applications. Many mentioned support from ICT. "I battle to get quick support from both library ICT and Unisa ICT; it's the frustration with the ICT; Need user friendly sophisticated ICT; more training needed. These show that the librarians are sufficiently enlightened about their roles in respect of the web technologies, and that they are actually encountering challenges in their use of the web to deliver information service, and they also have ideas about the gaps in current information technology tools used in the library and possible solutions to the challenges.

Analysis of the DOI/TAM Variables

From Table 7, a mean value of 1.80 means that majority of the responses in respect of perceived usefulness fall into the category of 'agree'; perceived ease of use, relative advantage, compatibility, and trialability all fall into the same category.

Table 7: DOI/TAM variables

Variables	Mean	SD
Perceived usefulness	1.80	0.87
Perceived ease of use	2.18	0.94
Relative advantage	2.09	088
Compatibility	2.37	0.98
Complexity	2.78	0.95
Trialability	2.41	1.05
Observability	2.57	0.95
Communication	2.52	1.05

However, responses on complexity, observability and communication differ, as the mean values fall within 'undecided' category.

Testing the Hypotheses Using Correlation Analysis

Figure 1 is the Pearson product-moment correlation coefficients of TAM and DOI variables, showing the extent of the relationships amongst the specified variables in the hypotheses.

H1. The perceived usefulness of web technology tools by librarians at the UNISA library will positively lead to adoption of the tools for library services.

The results affirmed that web technology tools are useful positively influenced their adoption although the relationship (r=0.314, p< 0.001) is weak. Previous literature such as Abdekhoda, Denhad, Ahmadi and Noruzi (2016); Al-Suqri (2013); Buabeng-Andoh (2017); Afari (2010), among others, also reported similar findings.

H2. The perceived usefulness of the web tools by librarians at the UNISA library will significantly depend on the relative advantage the librarians expect to gain when using such the tools.

Figure 1 shows a strong and significant correlation between usefulness and relative advantage (r= 0.775, p<0.001). The hypothesis is therefore supported. Wu, Li and Lin (2010) made similar findings about relative advantage having a positive influence on the perception of usefulness.

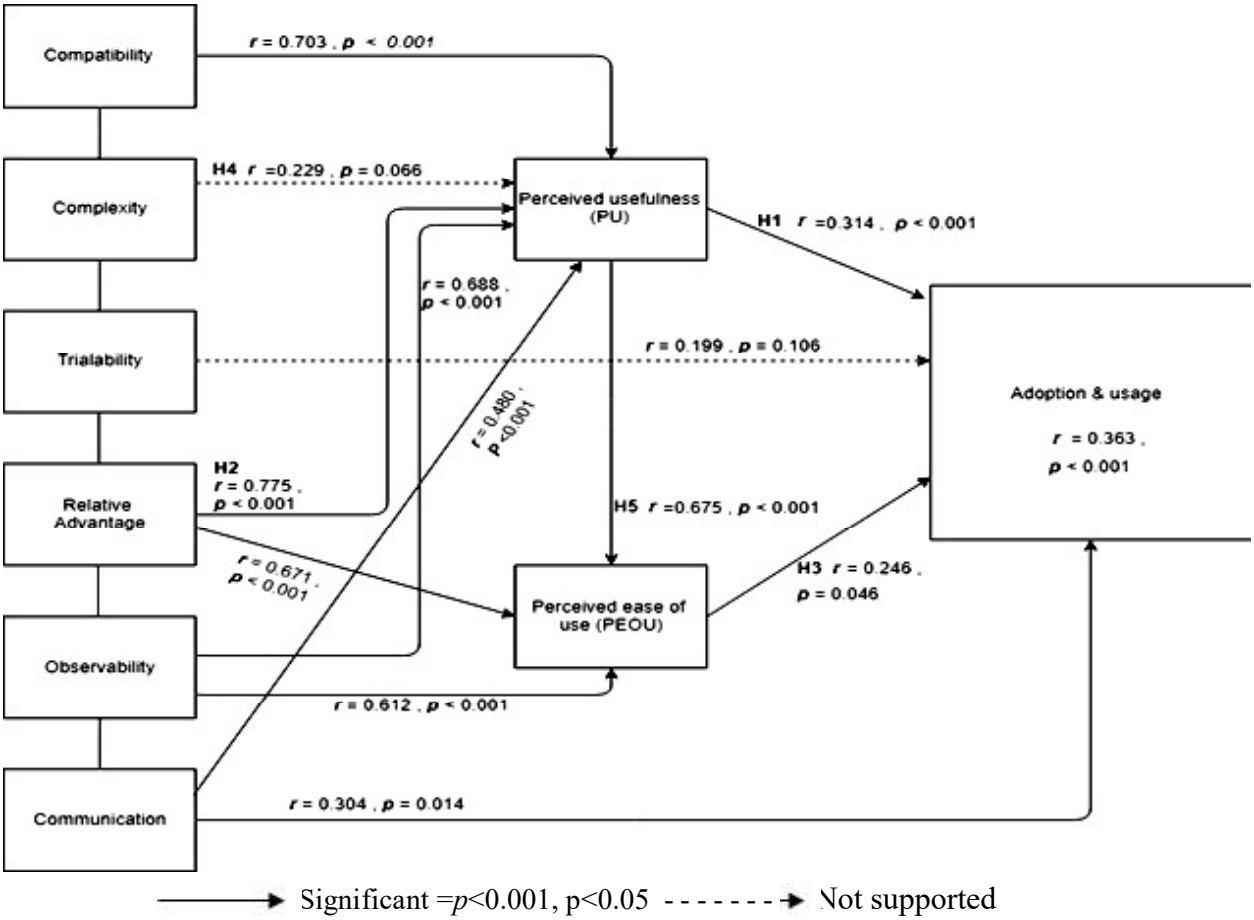

Figure 2: Conceptual research model with results (Adapted from Abdekhoda et al, 2016)

H3. The perceived ease of use of web tools by librarians at the UNISA library will significantly influence the acceptance and adoption.

Figure 2 shows a strong but low relationship of perceived ease of use with the adoption of web technologies (r= 0.246, p=0.046). This hypothesis is hereby supported. Thong, Wong and Tam (2002) as well as Abdekhoda, Ahmadi, Gohari and Noruzi (2015) revealed in their studies that perceived ease of use has an impact on the decision to adopt.

H4. The perceived complexity of library web technology tools by librarians at the UNISA library will have a significant influence on the perceived usefulness of the tools.

Figure 2 shows a weaker and not significant correlation between complexity and perceived usefulness (r=0229, p=0.066). Respondents in this study did not associate complexity of web technology tools with the usefulness and lack thereof. The hypothesis is therefore not supported. The studies of Lee, Hsien and Hsu (2011); Ramavhona and Mokwena (2016) also found no relationship between complexity and usefulness.

H5. The perceived usefulness of library web technologies by Unisa librarians will significantly depend on the ease of use of the tools.

Figure 2 shows a strong and significant relationship between ease of use and perceived usefulness of web technologies (r=0.675, p<0.001). Unisa librarians find web technologies useful as long as the tools are also easy to use. This finding conforms to those of Stoel and Lee 2013, Lee, Kozar and Larse 2003, and Mensah 2016.

Discussion of Findings

This study examined the adoption, use and acceptance of web technologies innovations by librarians in Open Distance e-Learning at the University of South Africa to support geographically dispersed researchers and students. Data was collected from 68 librarians using a questionnaire that also has open-ended comment sections. More females responded to our invitation to participate in the study, and more females also completed the questionnaire. There is evidence however that there are more females in library practice than males (Mbambo-Thathu 2019). In respect of completing research tools, Smith (2015) has shown in his study, however, that in respect of online survey a significantly larger percentage of female faculty members returned surveys than did their male counterparts. This observation couples with the general low response obtained in respect of completing the instrument to highlight the problem of low response in online surveys. With more than 50% of the participants being people over 50 years old, chances abound that the leaders of the library are people who may not be as technology savvy as their subordinates.

Studies that show that young people are more prone to embracing and using information technologies than older people are ubiquitous (Morris and Venkatesh 2000, Niehaves and Plattfaut 2014). Over 50% of the librarians were aged 50 and above, whiles many as 39.71% have spent more than 20 years at Unisa library, although there has been a change since the past 6-10 years when a large number of library workers have been employed. Librarians who trained 20 years ago would have less of information technology as components of their library education than those who trained in the recent 10 years or less.

Based on their self-rating, majority of the respondents are innovators. Innovators occupy the highest level of technology adopters in Rogers's hierarchy (Rogers 2003). A large number of innovators among the librarians means that there is higher opportunity for deploying IT, and also addressing the ICT challenges when they occur (Lwoga 2008). A higher number of innovators may indicate the potential of readiness to adopt web technologies by librarians. Of significant interest is the finding that there is no significant relationship between age, gender, and, number of years of service with innovation category (Holland 1997). This prospect notwithstanding, the proportion of early adopters, that is, those that can influence others to adopt technology for library services purposes, is very low (7.4%) compared with the relative high number that requires training to do the same (35.82%). The librarians have used a wide range of web tools in the last five years although Facebook (FB), a social media tool and Mendeley, a reference/citation tools are the

most used. We do not know the specific library services offered through the technologies, although FB can be used to invite library clients for training or to announce training and other programmes (Kennedy and Shields 2012).

Despite more than one-third of the respondents reporting to be innovators and early majority respectively, many of the respondents reported that their online clients and end users in branch libraries might either not have adequate access to the technologies used by the main library, or might not have the required capacity to benefit from the online library services. The librarians recognised the differences in levels of technology adoption in different locations of their clients; it can be alluded therefore that the web technology skills of the librarians at Unisa might not be as much a challenge to effective library services, but rather the state of web technology skill adoption and acceptance in the locations of the clients. Maul, Saldivar and Sumner (2011) had earlier observed that librarians were fast coping with emerging technologies in the library. In several studies, researchers have examined and upheld the fast rate at which people embrace and accept technologies that enable them provide services to their clients (Brandtz 2010; Danielson and McGreal 2000; Davis 1989; Deffuant, Huet and Amblard 2005).

Technical support and network issues top the challenges the librarians encountered. Technical support means that there is interaction between clients, librarians and technology with the aim of assisting clients and librarians' everyday practices and services (Grönroos 2008). Technical services are important because of the rapid rate at which new technologies are emerging to address issues in more modern ways, and librarians and clients need to be in seamless touch. Technical support activities include complex interactions and relationships through which the librarians and clients get maximum benefits of the technology tools, and optimize the usage of products and business risks that are related to the utilization of the technology tools. Technical support should be informative and educational, and should be an element of the integrated library service design. Most of the challenges reported by the respondents are tied to the subject of technical support.

From the perspective of librarians, technical support involves offering support to librarians and library clients accessing library electronic resources. Such support may include off-campus access settings, browser and connection problems, article download errors, library pin settings amongst others (Unisa Library Technology Libguide, 2019). Cunningham; Knowles and Reeves (2001) further expatiated technical support when they investigated the potential software and/or hardware problems in the library setting, and locate the solutions to problems before they occur. Gajic and Boolaky (2015) have examined how technical support aid performance in a manufacturing industry. They showed that technical services address relationship quality, knowledge required for providing help in getting maximum product benefits, sharing of knowledge, and a range of product and service offerings that satisfy customer needs. In the case of online library services, there is a need to examine the meaning and ways of efficiently deploying technical support to ensure that online learners and librarians are seamlessly linked.

The participants' comments on the challenges to effective web technology tools deployment are very critical, and they relate to issues that would require further investigation. For example, the issue of colleagues' resistance to accept and adapt to new technology and management's resistance to try out new technology may be pointing to administrative and leadership issues. Given the evolving nature of web technologies in the library, building technical capacity should embrace all levels of the library management so as to ameliorate management and leadership bottlenecks that impinge operational performance. A further example has to do with the reference to obtaining official approval to purchase licenses or to develop products in support of the information service. Tall bureaucratic processes, poor commitment to task, low level of knowledge about details and urgencies involved in the tasks performed by the librarians which were mentioned by the respondents could account for this observation. As far back as 1978, Beverly Lynch had described the library itself as a bureaucracy.

Slow and cumbersome tender/procurement process and confusion of correct forms and procedure to follow when submitting business specifications and requirements, for instance, are evidence of tall bureaucracy. Welch and Pandey

(2007) explored issues of bureaucracy as impediment and red tape to implementation and procurement of intranet services in e-government scenario. The question of lack of clear written and accessible guidance from library/institution on procedural matters around technology requires that the library pays attention to library communication. The library's focus should be research based, such that issues about the technical support and needs in the environments of dispersed students can guide how students' needs are addressed.

The library staff are interested in deploying web technologies in their services, but enhanced communication with colleagues, knowing the strategic objectives of the institutional library and clients' expectations join to motivate the librarians. Communication with colleagues, the need to meet the expectations, consciousness of the reality and rapidity of new technologies spur the librarians to duty. Library colleagues being a source of influence on adoption of web technologies continued to reoccur in the comments made by the librarians. Most incidentally ICT colleagues who are expected to be the providers of the technical support are sources of influence to a few numbers of people. Evidently ICT colleagues may not be librarians and communication between them and the librarians may be fraught with differences in language. Librarians who have technical knowledge of the issues involved in using the technologies to provide library services will be better sources of knowledge to their colleagues. The Unisa Library has an ICT Section which also assists in bridging the technical barrier between the librarians, library clients and other ICT staff. Improved communication will be required to reduce the gap between librarians and ICT staff in relation to library services.

The librarians agreed with perceived usefulness, perceived ease of use, relative advantage, compatibility, and trialability of web technologies as enablers. But they were undecided with respect to the technologies being considered complex, and whether they require to observe use of the technologies before embracing them. Most unexpectedly, the librarians were also undecided with regards to the role of communication, despite the librarians having strongly reported that colleagues are very crucial in their use of the new technologies. Ethical, legal and online security issues are very important and should be investigated and handled up front before new web technology tools are adopted, and factored into any training offered to staff and students, and into interaction with staff and students. Even knowledgeable users are vulnerable because cyber security issues have become a complex and sophisticated issue. Buchanan, Paine and Reips (2007) interrogated the issues of privacy for end-users on the online environment and emphasised the importance of looking at issues such as the guarantees of confidentiality if virtual learning environments allow student behaviour to be tracked and the ethical implications thereof. The relationship between this observation and the job of a librarian is so apt. A librarian dealing with a student online might equally be dealing with a criminal who is collecting information for an unwholesome purpose.

The question of users living with disabilities has been an issue of global concern for some time, inviting a more serious attention to inclusionism. Unisa has a provision and dedicated staff for catering for clients with physical disability. Several assistive technologies such as Blaze EZ, Booksense Victor reader Stratus and others are available for use by these specialised group in order to enhance their access to library resources (Unisa Library Libguide on Disability services, 2019). By suggesting establishing a web technology laboratory where products could be designed to meet own ODeL library needs, the Unisa librarians seem to be asking for a re-tooling of the ICT paraphernalia of the library. The librarians are suggesting that library information technology planning and implementation should be inclusive, involving librarians at all stages and locations, and not just bringing in the librarians at the stage of training and use. The university authority should … *keep in mind that perpetual change is fatiguing (even boring) and to investigate ways to support staff to enjoy the ride, and to truly take their advice and input on board. Front line staff are a fount of knowledge when it comes to evaluating the problems of a technology in practice.*

Conclusions

Despite being mainly innovators and early majority in library web technology adoption, the librarians still reported an overwhelming need for technical support.

References to technical support in this study mainly referred to ICT staff and their responsibilities. This observation raises questions regarding the type of ICT training offered to the librarians. Beside technical support that is offered by ICT staff, there exists a library function known as 'library technical services'. These are librarians themselves but they have adequate technical training in the area of library information technologies. One implication of the findings in this study is that the factors affecting performance of the librarians are not located within the conventional TAM and DOI models. The librarians appear to be comfortable with the basic issues as suggested by the outcome of the model; but there are locale-sensitive issues that impinge on their performance such as ethical issues, training needs, administrative bottlenecks, among others. The issue of ICT laboratory to test ICT tools before they are implemented resonates in the cultural question – science and technology are cultural sprouts. Addressing this big observation requires a very fundamental discussion; but a first step may be to identify what is un-African about the tools, and what could be done to localise them.

Implications for Practice and Research

Unisa needs to continuously inform, enlighten and educate its clients whenever they implement new web technologies, and mount online tutorials to ensure that clients also cope with the changes. A feedback mechanism that is integrated with the learning systems needs to be installed to ensure that clients study the new technologies. Research is required to investigate some of the impediments that clients encounter when accessing the web technologies. Also, administrative functions need to be re-engineered to reduce the challenges of *red tape* observed by a respondent. Documents on procedures for procurement and others need to be reviewed to reduce provision that obstruct technology and technology service procurement processes. Furthermore, Unisa needs to birth increase and strengthen library technical services as a veritable strategy to address the distance between ICT technical service providers and the librarians.

Attention needs to be directed towards how to harmonise web technology implementation in the various branches of Unisa Library with capacity and technology of distance and online clients. While this is a difficult task, an initial strategy might be to undertake periodic investigation of the levels of technology acceptance and adoption in online and distance students and learner locations. This study also unveils a very crucial element in web technology implementation in Unisa, namely the role of non-technology functions and activities. For example, a respondent said: *The approval and procurement processes hinder the adoption of web technology and by the time we implement, there is already something new and more exciting than the technology we just acquired.* Technology capacity is not a domain of the technology users only; those who play administrative roles, for instance, a*pprovals,* also require some understanding of new developments and their essence and should also be made conscious of the urgency of their decisions in view of the short life span of web technologies. Ever increasing role and significance of information technology means that Unisa Library will also continue to acquire more technologies.

How do the ICT librarians more fruitfully integrate Facebook into the roles of other web technologies in view of its dominance compared with other technologies? This question deserves attention by practitioners and those ICT experts who understand the critical role of ICT in the library. Added to this observation, how does the library improve use of other technologies by librarians, besides social networking and citation management tools? While technical support may be a common cliché in respect of library ICT in Unisa Library, there is need to practically examine the meaning and nature of library technical support in the library, and the extent of performance of existing library technical support services based on the opinions and experiences of Unisa librarians in this study.

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