Integration of Digital Preservation Knowledge, Skills and Competencies in the Teaching Curricula of Library and Information Studies at the University of Botswana

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Abstract

In the past few decades, digital technology has found a place in the acquisition, arrangement, description, preservation, and dissemination of information. However, heritage institutions are perturbed by the challenges of digital preservation strategies particularly for education. Despite continuous investment in digital preservation, there are limited skilled professionals to equip learners with the knowledge, skills and competencies required to drive digital preservation in Botswana. Therefore, this paper investigated the knowledge, skills and competencies related to digital preservation in the teaching curricula of the Department of Library and Information Studies (DLIS) at the University of Botswana. Data collection was done through intensive structured interviews with specific educators who teach courses on digital preservation in the archives and records management stream. The study revealed that despite the fact that the educators in preservation courses are aware of current trends in digital preservation, most of them have not obtained formal degree certification specific to digital preservation. The findings further revealed that minimal digital preservation competencies are observed in the teaching curricula. A significant number of challenges observed illustrated mainly a lack of resources and limited skills in terms of practical demonstrations by educators. The curricula mostly lacked clarity on long-term and short-term digital preservation. The study recommends that DLIS and other institutions should conduct surveys or curriculum auditing on digital preservation in order to improve the teaching content. A significant number of shortcomings regarding digital preservation that could motivate further studies are also discussed under the conclusion and recommendations section of this study.

Introduction

Education, particularly tertiary education, plays a critical role in national development through high-level skills development and relevant manpower training that allow the inculcation of proper values for the survival of the individual and societies. It is the art of imparting knowledge and skills, the ability to make decisions and the process of helping humans to understand the world around us and be ready to respond to various stimuli. Education allows the development of the intellectual capabilities of individuals to understand and appreciate their local and external environments. It imparts physical and intellectual skills which will enable individuals to be self-reliant, promote scholarship and community service, cement national unity and promote national and international understanding (Edegbo 2011). These acquisitions, developments and inculcations of proper valuable knowledge for the survival of the community change with time and space and vary from one country to another. In imparting knowledge and skills, universities, schools and trainers have to come up with various curricula that guide the delivery of information.

To this end, library and information professionals have to act as facilitators, advisors, consultants, instructors, researchers, evaluators, preservers, promoters, communicators as well as managers, leaders and entrepreneurs of information resources (Edegbo 2011). As a result, professionals in the library and information field have to come up with various teaching and learning programmes. These programmes must keep up with current trends and developments and address the needs of societies. Information and communication technology (ICT) innovations have gained popularity in education in recent times. The increased use of the World Wide Web in private, government and social lives of many people indicates that ICT is a vital component in schools, universities, careers and other areas that make use of information and communication (Fourie and Bothma 2006). This implies a significant number of questions to address in education, which include but are not limited to the following: How do teaching and learning programmes use ICT? What ICT innovations need to be taught as part of curricula in library and information studies? What challenges are experienced in teaching ICT related modules? How can ICT innovations be preserved? And how do library and information educators impart and integrate knowledge and skills on the preservation of digital records?

Quite often heritage institutions fail to identify the actual cause of the problems in museums, libraries and archives and conclude that financial challenges are at the core of heritage management. Ngulube (2007, 160) asked a critical question:

> Is it not putting the cart in front of the horse by emphasizing the need for funding before
> addressing the skills development issues? For instance, conservation of individual items

may be costly and very few institutions are able to deal with all the items that need treatment, but preventive conservation measures such as good housekeeping, and appropriate storage or reformatting of fragile materials may avoid such costly treatment interventions. Skills and knowledge become critical to one's ability to make decisions about everyday care for heritage collections.

The point Ngulube emphasises is that heritage institutions need to first understand the various levels or amplitude of challenges experienced in heritage management before coming to conclusions. In most cases heritage institutions cry loud about funding before understanding the root cause of problems (Ngulube 2007). Although the trends on digital preservation teaching are not yet well-known in most African universities, students, researchers, community, private and government entities are continuously adopting digital innovations in their daily lives. For example, institutions throughout the world are increasing the adoption of digital media to market their resources, capture information and even preserve information resources which are in the form of digital records, for example, DVDs, CDs, websites, social media and so forth. These developments have therefore triggered an alarm in most universities to move from the traditional teaching and learning methods of preservation to keep abreast with ever-advancing technology.

As networking and access to digital sources change the scholarly work process, a high degree of integration of source materials and analytical processes by coupling research sources with tools necessary to analyse them becomes critical. Moreover, maintaining linkages between research and the sources on which it is based and providing a means to incorporate primary sources into teaching become critical (Hedstrom 1997). There is a transition from traditional preservation and conservation styles to modern ICT-based principles of digital preservation. Therefore, in addition to the common challenges with the preservation of tangible materials, digital preservation brings a new set of challenges to the teaching and learning process (Hedstrom 1997). Despite continuous investment in digital preservation, an inadequacy of content in the teaching curricula is observed in many institutions, especially in library and information studies programmes. The problem at hand is that heritage institutions are perturbed by the challenges of preservation strategies, particularly in relation to education. Preservation courses in library and information science education continuously change and there is an urgent need to address various challenges that emerge especially in line with ICT. As the proverb says, "an axe without a handle does not cut firewood"—without education the preservation endeavour will always be a daunting process. Articulating the specific knowledge, skills and competencies required to perform analogue and digital preservation functions, research and development is an excellent basis for designing educational and professional teaching curricula. In order to address some of these gaps, this paper explores the integration of knowledge and skills related to digital preservation in the University of Botswana's Library and Information Studies (DLIS) curricula.

Literature Review

This literature review focused on broad information resources on digital preservation, and defining digital preservation, educational issues, curricula content, and competencies for digital preservation.

Defining Digital Preservation

Preservation is a broad term used across various fields including libraries, archives and museums. The Society of American Archivists (SAA) defines preservation as the professional discipline of protecting materials by minimising chemical, mechanical and physical deterioration, i.e. an obligation to protect records by keeping them from harm, injury, decay, and minimising the loss of information to extend the life of materials (SAA 2019). The term preservation is thus applicable to various circumstances depending on the nature of materials and the context in which the term is used. When it comes to digital materials, digital preservation/curation is used as the term that refers to planning, text corporation, marked-up text, decision making, resource allocation, and the application of preservation methods and technologies vital in ensuring that digital information of continued value is accessible and usable in the long term (Hedstrom 1997; Poole 2017). The term digital preservation is often used interchangeably with other terms such as digital curation, digital archiving and digital stewardship. In line with digital preservation other activities include digitisation. Digitisation involves the codification of information through which analogue materials are converted to digital materials and assigned metadata (Akinwale 2013). Although these terms, one way or another, have the same concerted competencies, these are the broader terms that include preservation as part of their competencies. In South Africa the term digital preservation encapsulates the processes and activities that stabilise and protect reformatted and authentic digital electronic records (Drijfhout 2007). Digital preservation should thus be understood as the term that underscores the ultimate goal of long-term protection of records. Not necessarily all the information that has been processed during digital curation may be preserved for the long term. To this end, digital preservation is more about the long-term availability and accessibility of records in digital formats.

Among other preservation fields, digital preservation has gained popularity as a platform for providing distance learning models (Peters 2002), and preserving electronic or digital collections in libraries, archives and museums. Although various proposals on frameworks that can be used for digital collections are available, it is still not clear what aspects need to be preserved. Jeffrey (2012, 556) posits that "the question is not whether a particular website will still be around in two or five years' time, the question is whether the data contained therein will be available in twenty-five or fifty years' time." This implies that preservation professionals need to be aware of what to preserve for business continuity or for posterity and what not to preserve. The process of digital preservation should therefore be perceived as a continuum of activities right from the data creation period. This is why the professionals in the field posit that digital preservation should

follow the Records Continuum Model rather than the Records Life Cycle perspective. The Records Continuum Model uses a purpose-oriented approach that is dependent on a series of actions that portray the continuity and maintenance of records. The Records Continuum Model illustrates that the process of records management, particularly with regard to electronic records, follows a continuous process with dimensions of creation, capturing, organising and pluralising records (An 2003; Upward 2000).

Trends in Digital Preservation

The use of digital collections has gained popularity and brought about various views on terms that can be used to embrace the profession. Kim, Warga, and Moen (2013) posit that the terminology for digital curation is not yet stable; some countries call the term digital curation, digital preservation or digital stewardship. The world depends upon long-term access and use of meaningful and authentic digital resources, which in turn require concerted, and appropriate digital curation efforts (Lee, Tibbo, and Schaefer 2007). Digital technologies such as computers, information networks and software applications find various application in heritage institutions. Digital technologies such as social media are gaining tremendous popularity throughout the world. For instance, in the past few decades, social media has found a place in the acquisition, arrangement, description, preservation, and dissemination of information. Social media undoubtedly plays a pivotal role in enhancing access to information resources. The trends on social media usage are marvelous and have enormous impact on economic development, but the management principles are in chaos and these uncertainties make the preservation management of records difficult to handle.

The commonly advocated digital preservation strategy is the Open Archival Information System (OAIS) reference model (CCSDS 2002). Issues that need to be addressed in digital preservation extend to the maintenance of structural characteristics, metadata, access and display, computational, managerial and analytical capabilities that are very demanding, mass storage, hardware and software for retrieval and access (Hedstrom 1997).

Knowledge, Skills and Competencies in Digital Preservation

The literature highlights an exhaustive list of critical knowledge, skills, abilities and/or competencies in digital preservation/curation/stewardship (Cushing and Shankar 2019; Kim, Warga, and Moen 2013; Lee, Tibbo, and Schaefer 2007; Madrid 2013). Table 1 illustrates some of these skills and competencies required in digital preservation.

Table 1: Summary of competencies for digital curator/preservation/stewardship

Lee, Tibbo, and Schaefer (2007)	Madrid (2013) and Cushing, and Shankar (2019)	Kim, Warga, and Moen (2013)
a) Access and Administration • Advocacy, outreach, analysis and characterisation of digital objects • Evaluation of producer information environment • Collaboration, coordination and contracting with external entities • Data management, reference and user support services **b) Legal and Ethical** • Description, organisation and intellectual control • Production, purchasing and licensing of resources • Validation, evaluation, audit and quality control of digital objects **c) Technical** • Storage, documentation, selection, appraisal,	**a) Access and Administration** • The ability to understand IT-related digital materials and identify risks • Ability to collaborate and communicate with professionals, and international partners • Ensure provenance of the preserved data and user needs • Understanding different preservation, record keeping theories and practices **b) Legal and Ethical** • Auditing and compliance assessment and preparing a business case • Knowledge of relevant digital curation standards and best practices **c) Technical** • Knowledge of information architecture, system	**a) Access and Administration** • Work in an information technology environment • Project management • Personal and interpersonal skills • Research and trends • Liaison and support • Library/archives skills • Professional development **b) Legal and Ethical** • Standards and specifications **c) Technical** • Functional working knowledge and skills for curation • Tools and applications

description and disposition	design and implementation	
• Systems engineering and development	• Ability to select and appraise digital documents	
• Transference and transformation of digital objects	• Ability to monitor obsolescence, develop file formats, hardware and software	
• Research and development to support curation functions	• metadata regimes	

Source: Synthesis by the authors (2018)

Demerits of Digital Preservation

The new aspects of ICT considered in preservation curricula come with diverse transitional challenges. These vary from technological, management, economic and financial, to educational aspects. As indicated in various sources (Hedstrom 1997; Keakopa 2008), the more insidious challenges in digital preservation are the obsolescence in retrieval and playback technologies, digitisation, conversion and migration. The tremendous innovations of software and hardware driven by various market needs culminate in less consideration for the stability, encoding, representation, and other operational functions during the manufacturing process. These lead to new digital information resources with no standards or slow prioritisation in the development of strategies for digital preservation. Examples of such instances were observed in a study by Kalusopa (2008; 2009) in which 26 organisations were investigated in Botswana. Conversion and issues of improving capture rates, accuracy, resolution, and verification are some of the common challenges discussed in relation to digital preservation. Other issues include management issues such as untrusted methods for preservation, low skills and expertise and low prioritisation of preservation principles during digital information creation processes. Limited avenues on migration and the difficulty in predicting its necessity and commencement are challenges in digital preservation.

Although digital preservation requirements remain experimental and there is abundant investment in it, in most developed heritage institutions a significant number of problems such as limited articulation from either the user's or provider's perspective remains a challenge. Similarly there has been less consideration of the architecture, resource allocation and planning for digital libraries (Hedstrom 1997; Kouper 2016). In principle, digital preservation should consider the fact that digital conversion should be perceived as a complementary process rather than a replacement for the originals. This

view could be due to limited education on the principles of digital preservation. Therefore, the challenges relating to preserving the originals still remain despite digitisation. The process of digital preservation could significantly benefit if the information systems that generate digital information are designed to support long-term preservation which involves migration, conversion, digitisation, and adequate metadata descriptions.

Statement of the Problem

Despite continuous investment in digital preservation, there are limited skilled professionals in Botswana who can teach the curricula on digital preservation. The possible factors that contribute to the problem regarding teaching curricula in library and information programmes include lack of prioritisation of preservation in teaching, a shortage of skilled staff/educators and vague preservation theories. Other boundaries related to digital preservation are the World Wide Web features that are difficult to ascertain, volatility of the software, and continuous loss of information due to document change, sites' disappearances, and links between documents that change, move and vanish (Hedstrom 1997). Moreover, there are no conceptual models or technical processes for the preservation of multi-media and online dialogue of many of the new electronic forms. In trying to address some of the digital preservation challenges scholars have focused on research on architecture and systems for information organisation, retrieval, presentation, visualisation, and administration of intellectual property (Hedstrom 1997; Keakopa 2008). While studies have indicated that digital preservation was observed in various public and private sectors in Botswana (Kalusopa and Zulu 2009), and highlighted the challenges (Kalusopa 2008), little has been conducted to understand the knowledge, skills and competencies required for digital preservation in the teaching curricula. Therefore, this study aimed at determining the integration of knowledge and skills on digital preservation in the DLIS curricula and to make recommendations for improvement. The specific objectives of the study were to do the following:

- determine lecturers' knowledge, skills and training acquired on digital preservation at the DLIS;

- establish the integration of digital preservation content in the DLIS teaching curricula;

- determine the teaching tools and resources on digital preservation in the teaching curricula;

- identify the challenges of the digital preservation teaching curricula at DLIS; and

- make recommendations for improving the teaching curricula and skills in digital preservation.

Methodology

This baseline study was conducted at the University of Botswana's Department of Library and Information Studies (DLIS). The department consisted of four streams, namely Archives and Records Management (ARM), Business Information Systems (BIS), Knowledge Management (KM) and Library and Information Studies (LIS), with a total of 18 educators. The study was cross-sectional in nature and a qualitative approach was used to address the research questions. The study took the route of purposive sampling in which structured interviews were conducted with specific educators who teach courses with some aspects of digital preservation in the Archives and Records Management stream. The interview approach was intended to ensure that the same general areas of information were collected from each interviewee, providing more focus and allowing a degree of freedom and adaptability to get more information from the interviewee. The ARM stream had a total of five educators, including one of the authors. However, only three educators were interviewed since one educator was recently hired and was still familiarising herself with the university curricula. Given that one of the authors is part of the department this gave the researchers an advantage to include direct observation and participatory strategy. This is in the sense that one of the authors participates in departmental committees that deal with curricula development and reviews. Additional information was collected through the experience of the authors; one of the authors teaches some of the courses while the other continuously offers guest lectures within the department. Qualitative researches are well articulated in the literature for their rigour in introspective, participatory or naturalistic and reflexivity practice (Aspers and Corte 2019). Table 2 illustrates information on interviewees' positions, the duration of the interviews, and their experience teaching professionally. The interviews lasted for about 30 minutes with each respondent, giving a total of 1 hour 39 minutes. All three respondents had a Doctor of Philosophy degree in Library and Information Studies. The interviews were crucial to get detailed information and allowed advanced freedom of expression for the respondents to give detailed information on the studied phenomenon. The information collected during the interviews was recorded using a mobile phone audio recorder, downloaded onto a computer, analysed and the results were coded into themes to address the objectives of the study.

Table 2: List of interviewee respondents

Interview duration	Interviewee position	Teaching experience	Courses/modules taught with aspects of digital preservation
30 minutes	One professor	Over 40 years	REC 606, REC 213, REC212
39 minutes	One senior lecturer	Over 20 years	REC 602, REC 604, REC 215, REC 213
30 minutes	One senior lecturer	Over 20 years	REC 215, REC 213

Source: Field data (2018)

In order to strengthen the findings, document analysis was also conducted. The researchers performed document analysis on course outlines on preservation. A total of eight (8) courses were selected as relevant for the study since they covered some aspects of preservation. The researchers intensively investigated the curricula (course outlines) used at the DLIS in order to understand and get information on content, purpose, method, time/duration, trainers and location or situation of the courses in digital preservation. The qualitative information from document analysis was categorised into informative themes for discussions on the study objectives.

Findings and Discussions

The broad objective of the study was to establish the knowledge, skills and competencies on digital preservation contained in the teaching curricula of DLIS. The researchers sought to determine educators' skills and knowledge on digital preservation, establish the level of integration of digital preservation content in teaching curricula and establish teaching tools and resources. Moreover, the study sought to establish the challenges of digital preservation at the DLIS. The findings of the study were revealed as follows in line with the specific objectives.

Knowledge, Skills and Training on Digital Preservation

Knowledge of and skills in ICT have become critical throughout the world in the information profession (Poole 2017). On their website, the DLIS (2018) clearly indicated that

> the infusion of ICTs in virtually all the DLIS academic programmes has been acknowledged as a vehicle that would be utilized to produce graduates needed by national and international labour market characterised by diversity of information and knowledge management employment opportunities in business, industry and government. This is given impetus by mainstreaming of information and knowledge management in the development framework of the World Bank and other development agencies.

For such ICT infusion to be relevant, educators also need to have appropriate teaching knowledge and skills in ICT and these should be relevant to the digital preservation process (Kouper 2016). This study sought to determine if educators at the DLIS do have digital preservation knowledge and skills. Following an intense interview with the three educators at DLIS, participants indicated that indeed educators had base knowledge on digital preservation and the knowledge and skills the educators had were mainly theoretical rather than practical.

Responding to a question on professional experience, a professor at DLIS revealed that despite not having formal training on digital preservation, he had been exposed to various informal training. He revealed that his knowledge was acquired through meetings on digital preservation, workshops and conferences. The respondent noted that his recent experience was in 2005/6 through a workshop that was conducted in South Africa. However, the workshop did not offer the participants hands-on experience. Despite this lack of skills in digital preservation, the literature reveals that the field is growing and it is an intersection of librarianship, archives, information technology, and other fields and requires a combination of existing and new skills (Kouper 2016; Higgins 2011).

When requested to indicate if the respondents felt that they were qualified in digital preservation, all participants stated that it depends on the coding that defines digital preservation. One participant indicated that

> it depends on the depth, the depth comes from practice, and how you have practised. Some of us you will find out that through consultancy we have been able to get to practice, working through partnering. But then the thing is the level of complexity, the level of comprehension. Certification is out, it is not all about theory.

The three interviewees felt that digital preservation is part of electronic records management. However, the disposition stage of the managing era is the one that defines or clarifies the preservation aspect. Generally, the findings revealed a mixed filling of thoughts between theory and practice. As much as formal certification is important, the study showed that hands-on, informal training and industrial needs determine the competencies required for digital preservation. In such a process it should be noted that complexity varies especially given that electronic records management is part of digital preservation. Such issues are also raised in the literature (iSchools 2019; Keakopa 2008). The difference would then be, is it long-term or short-term digital preservation? How could these be differentiated?

Digital Preservation Content in Teaching Curricula

The literature continuously reveals that digital preservation encompasses various competencies such as having a high level of IT proficiency in order to understand the digital material and identify risks, and the ability to ensure the provenance of the preserved data, and appropriate selection and appraisal (Drijfhout 2007). All three

participants were of the view that although the teaching curricula did cover selection and appraisal of digital documents, practical demonstrations were not conducted. Similarly, there was no clear criterion on long-term and short-term preservation. Participants indicated that digital preservation is somehow taught but not prioritised. One participant indicated that

> I think we are still focusing on the traditional theories and practice that form the basis of practices. Digital preservation comes a bit newer but still focus is on traditional, we still have students who focus on the Life Cycle model. If you look at our environment locally and in the region, we still have people who are fast in moving towards procurement of systems, but also a bit slow in terms of implementation because we are congested with paper. Unless we go back to paper and clear paper we will never make it in digital.

The participant indicated that the archival principle of provenance and original order is still prioritised in Botswana. One participant indicated that in the current curricula, the course structures and how these talk to digital preservation are critical. The participant further revealed that it was important to study processes and curricula related to tools that come from the standing committee on Archival Educators and the iSchools organisation, which is a consortium of information schools dedicated to advancing the information field. The literature concurs with this finding, indicating that iSchools has the mandate of advancing the information field, especially digital information management (iSchools 2019). Furthermore, one cannot talk about information without talking about preservation. However, there are indeed courses that are clear on digital preservation whilst other courses just imply digital preservation without pronouncing that it is digital preservation. Reviewing other sources such as the website for DLIS revealed that given the changing economic developments indeed the department was concerned with digital technology in information and library curricula. The DLIS (2018) website emphasised that "the Department of Library and Information Studies (DLIS) is where we continue to perceive information and knowledge management as a key resource and a competitive tool in national economic, social and political development."

Document analysis revealed that the DLIS consisted of three undergraduate bachelor's degrees: a Bachelor of Information and Knowledge Management (BIKM) with three streams including Bachelor of Arts in Library and Information Studies (BLIS), Bachelor of Information Systems (BIS) and Bachelor of Archives and Records Management (BARM). The department also offered a Diploma in Archives and Records Management (DARM) and some postgraduate studies including a Master's degree in Archives and Records Management (MARM), a Master's degree in Library and Information Studies (MLIS) and MPhil/PhD degrees in Library and Information Studies. Courses taught relating to digital preservation in the Archives and Records Management (ARM) stream for undergraduates, among others, included Records (REC) 213 "Introduction to Preservation and Conservation," REC 218 "Introduction to Computer Application and

Records Management" and REC 215 "Micrographics and Reprographics." Other graduate courses included REC 602 "Advanced Theory in Conservation and Preservation," REC 606 "Computer Applications in Records Management" and REC 604 "Electronic Records Management" (UB 2017). On average only four modules were specific to preservation within the whole DLIS programme. Some of the courses offered in DLIS, such as REC 605, offered competencies related to digital preservation. Table 3 illustrates some of the competencies observed in courses offered in the ARM stream.

Table 3: Competencies observed in DLIS

Courses	Competencies
REC 213, REC 215, REC 218	Ability to monitor the obsolescence and development of file formats, hardware and software. Understanding the context of creation of the digital objects, preservation planning etc.
REC 213, REC 604	Understanding different preservation strategies. Knowledge of relevant digital curation standards, best practices, workflows etc.
REC 604, REC 213	Ability to know the user needs to define significant properties, record-keeping theory and practice etc.
REC 604, REC 606	System design and implementation, metadata regimes, archival storage, etc.
REC 213, REC 604	Risk assessment, auditing and compliance assessment. Selection, appraisal and disposition.
REC 604, REC 602	Preparing a business case. Planning and understanding the context of creation of the digital objects etc.

Source: Field data (2018)

When asked to comment if a student with any of the courses offered at DLIS would qualify to work as a digital curator or in digital preservation, one participant commented that digital preservation is concerned with technological expertise. But this depends on what the market is interested in, the real core systems perspective or somebody who will be able to just manage the process from the front point. Responding to the same question, another participant responded that

> when we talk of digital preservation we are talking or concerned with technology. But again, what are we interested in? Are we interested in somebody who will be able to just manage the preservation process from the front-line desk? Or are we interested in somebody who will be able to work from back hand, the real core systems perspective? We have to understand digital preservation from three perspectives, the front end, back end and the technocrat perspective.

When requested to indicate if the courses offered at DLIS covered digital preservation, one of the respondents indicated that the answer is partly yes and partly no, explaining that the issues are theoretical. The educators are aware of issues but cannot offer practical skills and as a result the courses do not offer solutions. The participant further

noted with regard to REC 213 "Introduction to Preservation and Conservation" that the educator who teaches the course is expected to also introduce issues of electronic records management. The participant noted that REC 218 deals with ICT in archives and records management and is expected to touch on issues of digital records. The participant indicated that at master's level there are two courses. The first is REC 604, "Electronic Records Management," and whoever teaches the course cannot teach electronic management without teaching about digital preservation. The other is REC 606, which also deals with ICT and records. However, the participant indicated that although he was teaching preservation, his focus was not on digital preservation.

For an appropriate policy implementation in digital preservation, Drijfhout (2007) lamented that archival principles (e.g. planning, acquisition, selection, disposal, security and environment etc.) and technical skills on refreshing, transcribing, migration and emulation are critical in digital preservation. On average the findings revealed that as much as it should be crucial to integrate digital preservation in archives and records management, the process is limited given the limited resources and skills. The findings also revealed that on average certain aspects of digital preservation are covered although the courses do not explicitly use the term "digital preservation."

Teaching Tools and Resources in Digital Preservation

Another objective of the study was to establish if there were teaching tools and resources for the teaching curricula at DLIS. Participants were requested to discuss what teaching tools and resources they were using in digital preservation courses. The participants indicated that there was nothing much in terms of resources for digital preservation. Similar findings were also expressed by Kalusopa and Zulu (2009), indicating that the lack of standards on digital heritage materials preservation in Botswana is significant. This study revealed that the resources were lacking and as a result the courses were purely theoretical and no practical lessons or any experiments were carried out for the learners. This resulted in a serious skills gap that meant learners were unable to implement anything practical on digital preservation once they graduate. However, all the participants pointed out that there was a lab that was recently demarcated for digital preservation, though it was not yet fully equipped with all the necessary resources. One participant lamented that

> even though we have resources in terms of building, the expertise is a challenge. The lab is there but it also depends on who has interest in the area. You may find that maybe some staff are not interested on digital area but focusing on their areas of expertise.

In addition, they all lamented that the skills were also lacking internally to enable them to operate the lab and put it to its indented purpose. They suggested that it will mean collaborating with other departments like Computer Science and the sister unit in DLIS, Bachelor of Information Sciences (BIS) as well as the industry at large to try and equip the learners with the requisite hands-on skills. One participant indicated that she has to

call a practitioner outside the DLIS department to demonstrate some of the basic systems. The participants emphasised that the teaching curricula should be such that experts should liaise with the university to teach and demonstrate practical work.

Participants highlighted that the digital preservation teaching curricula at DLIS should consider the environment, ICT, infrastructure, policies, legislations and standards as critical issues that have to be looked into. Implementation was a challenge because of a shortage of tools and resources. The literature also indicates that as part of digital preservation various issues raised in Africa concern digital tools and resources. Lor (2005) posed a question about whether there is a role for repository libraries. The findings from Lor revealed that most African institutions do not have the capacity to collect and preserve digital materials (Lor 2005).

Challenges of the Digital Preservation Teaching Curricula

The ability to collaborate with international partners on issues related to digital curation is discussed in the literature as one of the critical issues to be addressed in digital preservation (Kalusopa 2008; Kalusopa and Zulu 2009). Participants were requested to indicate their views and perspectives when it comes to collaboration in digital preservation. One participant revealed that collaboration is critical in digital preservation and the records management profession at large.

Challenges highlighted concerned the issue of interest, awareness, and questioning why people are not talking about digital preservation. How would it benefit individuals as lecturers? The interest of the nation is no longer there. One participant highlighted that

> as the world is getting digital, the key challenge is the issues of posterity. Paper we are able to work on issues of posterity but in digital world, are we? … There is a gap between iSchools and other schools. The gap between developed schools and developing countries … In Botswana the parliament passed a bill on Electronic Records Evidence Act. The act presents a lot of issues around digital preservation. However, it may not come out clearly saying this is digital preservation. Therefore, we cannot look at digital preservation without legal aspects. This challenges us to be thinking along the lines of digital preservation. It is critical to start thinking on digital and regulatory aspects especially from national level.

One respondent indicated that one of the challenges could be from the national level on legal aspects and the influence of model curricula. It is therefore important to conduct studies to determine if we are aware of digital preservation, and if we are indeed aware, what are we doing about it? One of the respondents indicated that issues of e-Government initiatives are important. However, the participant lamented that "one would assume that when matters of e-government were discussed, one would have expected that the school (DLIS) would have been involved. Similarly, one would assume that the national archives should have played concrete role. Government in

terms of digital preservation pays lip services." The respondent further indicated that it is also critical to appreciate the process of programme development at UB.

Conclusion and Recommendations

This study sought to investigate the digital preservation knowledge, skills and competencies presented in the teaching curricula at the DLIS, University of Botswana. The study focused on the knowledge, skills and training of the educators, the integration of digital preservation content in the teaching curricula as well as the teaching tools, resources and challenges in the teaching curricula at DLIS. The study revealed that even though educators in preservation were aware of current trends in digital preservation most of them have not obtained degree certification specific to digital preservation. Very minimal formal integration of digital preservation knowledge, skills and competencies is observed in the teaching curricula. Given a significant number of challenges observed regarding digital preservation, a number of research gaps were observed, especially concerning the following: What are the coding factors for digital preservation, especially the disparity between long-term and short-term digital preservation? Is it necessary to formally or distinctively indicate within course curricula the aspects of digital preservation? Lack of clarity on professionals' priority areas and competencies between digital curation, digital preservation, and electronic records management etc. was observed. In the context of DLIS and other departments in the region, the study recommends that DLIS and other academic institutions should consider revising their programmes and creating standalone courses on digital preservation. This could be achieved through establishing thorough course audits and capacity building on the part of the educators. It could be achieved by attending refresher courses to develop the educators' practical skills on digital preservation for skills transfer to their learners. Departments have to acquire equipment on digital preservation for learners to carry out practical work to enable them to be able to go into the industry and have hands-on experience in this aspect. Moreover, stakeholder engagement, collaboration, partnerships, marketing and networking are critical. Collaborative efforts should be established with practising organisations for practical demonstrations and where possible they should be engaged with during the development of teaching curricula.

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