



**AHMADU BELLO UNIVERSITY LIBRARY
COMPLEX INTERNATIONAL CONFERENCE**

PROCEEDINGS OF

**2021
INTERNATIONAL
CONFERENCE**

DATE: 1ST - 3RD NOVEMBER, 2021

**THEME:
MANAGEMENT OF INFORMATION,
KNOWLEDGE, RESEARCH AND INNOVATION
FOR SUSTAINABLE DEVELOPMENT.**

**Held at: PG e-LIBRARY, KASHIM IBRAHIM LIBRARY
Ahmadu Bello University Zaria, Kaduna State, Nigeria**

AN EXPLORATION OF DIGITAL EXAM RECORDS MANAGEMENT AT THE FEDERAL UNIVERSITY LOKOJA

By

Imoisili O. Odigie¹

Dept. of Library and Information science
Federal University Lokoja
imoisili.odigie@fulokoja.edu.ng

Nafisat Z. Bako²

Dept. of Library and Information science
Federal University Lokoja
bakonafisat@gmail.com

Olayinka Mary Adekoya³

Dept. of Library and Information Science
Federal University Lokoja
olayinka.adekoya@fulokoja.edu.ng

Ezra S. Gbaje⁴

Dept. of Library and Information Science
Federal University Lokoja
ezra.gbaje@fulokoja.edu.ng

Abstract

Exam records are sensitive pieces of data that tell a story of the academic life of an individual while in the University. The study investigates how digital exam records are being preserved for long-term accessibility and use in the Federal University Lokoja. Qualitative research methodology, a case study design alongside a structured interview guide was used to examine the strategies in place to manage and preserve digital exams record for long-term accessibility and utilization. Findings of the study revealed that currently, the SQL backups and hard drives were the present means of storing exam records for long-term preservation. A major gap in the preservation of records at the Federal University Lokoja was the lack of a preservation policy thereof. The study, therefore, recommended that a preservation policy be implemented capturing the long-term preservation of records at the University alongside other recommendations.

Keywords: Digital Records, Preservation, Records Management, Exam Records, Federal University Lokoja.

Introduction

Decisions on what records to preserve for future purposes become a problem for many organizations at certain periods in their lifetime. Organizations are increasingly reliant on information communications technology (ICT) as a crucial component of business operations. As a result, information is often partially or fully in electronic form. The University system is not left out in these practices. The application of ICT in administering lectures especially in the recent Covid-19 era, submission of assignments online, writing computer-based tests and exams has become the order of the day in the end, these records are kept for future purposes.

Exam records amongst other records are a vital part of the University system. They contain each student's assessment, exam scores, and grade for every course taken in the course of his study. At the point of graduation, they are compiled and graded with a single score. These records can be called upon at any time for verification by another institution of learning or for job positions, etc. The school must preserve these records for as long as possible, hence the adoption of digital exam records.

Digital records require a computer or other related technology to be read, accessed, or used. These sorts of records are either digitally borne or created or transformed through certain processes like retrospective conversions (paper document scans). Digital Exam records provide faster and easy access to exam records. They are managed and preserved to reduce the risk of loss, theft, or other natural disasters that could affect paper records. Rosenthal, Robertson, Lipkis, Reich, & Morabito (2005) described the goal of any digital preservation system as to ensure that the information it contains remains accessible to users over a long period. However, academic institutions have in Nigeria have only just begun to grapple with how to preserve the digital resources they produce.

Lifecycle of a record

Unlike paper-based records, an electronic record can be manipulated, transmitted, and processed by a computer system. This means that by nature electronic records are recorded in binary code, written on magnetic or optical media, and hence can be altered or manipulated. Keakopa, Millar, O'Shea, Nordland, & Suderman (2009) highlighted the three important Attributes of Records to be:

Content: This is what the record says.

Structure: relates to both the appearance and arrangement of the content (for example, the layout, fonts, page and paragraph breaks, tables, graphs, and charts).

Context: information that helps explain the meaning of the document, one piece of information identifies the particular document, such as the title, author, and date of creation. Another piece of information identifies the creator and the purpose of creation, such as the nature of the business function or activity or the creating agency and unit concerned. This is sometimes referred to as metadata. When information is created, stored, and retrieved digitally new problems arise. It is pertinent that digital information is available to the future society for legal, historical, and democratic reasons. Numerous issues need to be addressed, some of the important ones are the context of digital information concerning the provenance principle and appraisal of public records, the attributes of digital information and its interpretation, the limitations of digital information processing tools and storage media. This leads us to a new view of the information life cycle in a long-term digital preservation context.

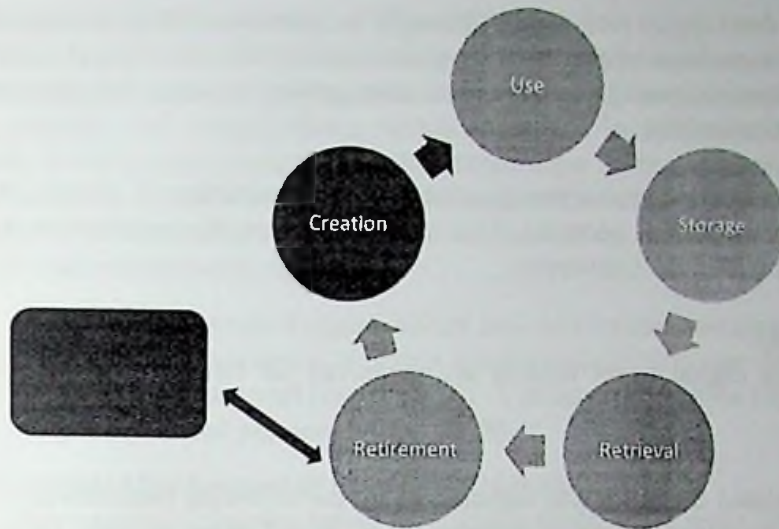


Fig 1: Information Lifecycle

Historical Perspective of Records in Federal University Lokoja

The Federal University Lokoja is a Public University-owned and managed by the Federal Government of Nigeria, like every other public university, it creates, manages, preserves, and retires records in its everyday running. The University was established in 2011 to solve the educational needs of the North-central States. Since its inception in 2011, it has convocated over nine hundred and eighty (980) students in three separate convocations.

This means an approximate thousand plus students' academic records are available presently, they are being managed presently and soon to be preserved for future use by the University's Directorate of ICT, which is charged with the management of these student records. So far, the Federal University has made use of two record management platforms and is on its third platform which is somewhat worrisome to the life of the young University.

Management of Digital Records Systems

Management refers to the administrative functions required for describing, storing, organizing, and retrieving digital content and metadata these functions can vary in type and complexity. Digital records systems present a spectrum of tools and activities that provide an appropriate level of management for a digital collection. This system is expected to be highly customizable, multi-functional performing a host of readying functions required for the preservation and access of digital records.

The high functionality and cost of implementing software mean singular use would result in a waste of resources and manpower. The need therefore for a shared digital records management system cannot be overemphasized, arising from issues such as cost or financial implications and technical know-how. Certain challenges arise to the management of digital records these are; technology obsolescence, Technology dependence (rendition), and Risks to Reliability and Authenticity.

Problem Statement

Preservation of records is concerned with maintaining the integrity of digital objects over a long period. It is a set of processes that ensure the information contained within a digital object is safe from medium failures as well as software and hardware obsolescence (Masenya & Ngulube, 2021; Rahman, 2021). Renditions systems of hardware and software must be

properly structured for these digital records to continually be accessible (Gbaje & Zakari 2013; Rahman, 2021). The researchers observed with great concern that the Federal University Lokoja had utilized and retired two (2) separate exam management systems, and was currently on its third since inception in 2011.

This is of great concern because the question of the preservation of already existing records is vital for future reference purposes. This research explores the preservation strategy of digital exam records within the University.

Objectives of the Study

To ascertain how digital exam records are preserved for long term use in Federal University Lokoja

Literature Review

The review of related literature was captured along the following subheadings; Digital records management challenges to the preservation of digital exam records, technology obsolescence and dependence, risks to reliability and authenticity, and policy on long-term preservation.

Digital Records Management

Recent technological advancements have left organizations dependent on Digital records in the delivery of information services to members and easy access to informational files or data created. These records must be accurate, completely captured, and preserved through time, to ensure the effectiveness of these, a digital record management system is usually employed.

Digital records Management also known as electronic records management is a set of activities required for systematically controlling the creation, distribution, use, maintenance, and disposition of recorded information in electronic format. Appropriate records management as noted by Chinyemba and Ngulube (2005) involves establishing systematic controls at every stage of the record's life cycle, through established principles and accepted models of records management.

Scholars have stated that a good records management system provides reliable information that allows an organization to operate effectively (Asogwa, 2012; Mukred & Yusof, 2015) while encouraging transparency and accountability (Yusof & Chell, 2000; Mohd & Chell, 2005). Atulomah, (2011) added to this by saying that Electronic Records Management Systems can meet the need for effective record keeping by ensuring that institutions of higher education will be efficient, maintain their records, remain trustworthy, encourage audits, become more competitive while meeting their fiduciary obligations, and preserve their transparency and accountability

The process of records management is in stages with preservation being one of the most vital aspects in this process. Electronic records tend to be at greater risks if requirements for their storage and preservation of electronic records are not met within the organization (Millar, 2004; Chigariro and Khumalo, 2018). Similarly, Sambo, Urhefe, and Ejitagha (2017) also opined that digital records are vulnerable to loss and destruction because of the medium of storage mostly utilized in Nigeria, they could fail suddenly from use on faulty reading and writing devices. It is a fact that in this system, challenges are bound to occur. some of these challenges are expatiated below.

Challenges to the Preservation of Digital Records

The Preservation of digital records is not new but relatively new to many archivists and record managers in the Nigerian context. Transforming from the traditional means of files, filing cabinets, and airtight rooms, which might still be somewhat relevant to paper-based records. It has several constraints in the preservation of an electronic or digital record. The preservation of digital records comes with greater challenges, challenges that delve into the integrity of the record, the stability that could result in the permanent loss of potentially useful data or render such records useless.

Data archivists, standard organizations, and information managers have identified certain challenges with the preservation of digital records to be technology obsolescence (ISO, 2005; Fritz, 2018), trained personnel (Iwhiwhu 2011), policy formulation (Hamidovic Haris, 2010), and inadequately trained personnel (Cox, 2018).

Technological Obsolescence of Electronic Records

The constantly changing nature of software applications and computer hardware has led to what is generally known as “technological obsolescence”. As innovations in computer technology appear, old systems become obsolete and are no longer supported by the technology industry. Backward compatibility and Obsolescence are a big issue that is still yet to be solved in data storage and preservation.

Digital preservation scholars have stated that media, hardware, or software components might become incompatible with other system components within a decade of their appearance, file format obsolescence might prevent content decoding and rendering (Chigariro & Khumalo 2018; Fritz, 2018; & Helfert, Reinholdtsen, & Sødning 2017). Examples of this are the 3½ inch floppy disks, Video and Audio cassettes and their players, Microsoft's Windows 95, XP, and Vista these technologies and software have gradually been phased out and are rarely used today in data storage or preservation.

Technological Dependence

Electronic records depend on technology, they are created and managed by computer hardware and software these electronic records require mediation to be accessed from creation till preservation. Technological dependence relates to media renewal since it is not possible to read the contents of a compact disk against the light, as one can with a paper document or a frame of microfilm.

Hardware and software must be upgraded regularly to ensure continuing access to information and records. Supporting this, ISO (2005), states media renewal as a baseline requirement for digital preservation because it is the only known way to keep bitstreams of electronic-document-based information alive. As technology changes, records need to be moved to new systems migrated so that they can be used otherwise, the formats in which records exist are incompatible and the records are increasingly inaccessible (ISO, 2005; Smallwood, 2013).

Risks to Reliability and Authenticity

Changes in information and computer systems require that information be migrated to new technologies for the information to remain accessible over time, this process of migration can affect the authenticity and reliability of the information. Reliability issues sometimes bother around hardware components in preservation, failure of these components results in a change in content or structure of records.

Hence, the need for highly reliable hardware in preservation strategy Kumar & Singh (2019) conducted a study on the color differences of western digital hard drives, he found that the blue hard drives were appropriate for desktop computing, red for Network storage, purple video, and gold for Datacenters. Unlike paper-based records, which can be used and reused, filed, for future reference without change, electronic records need to be managed and preserved in such a way as to secure their authenticity as evidence.

Casadesús & Cerrillo-i-Martínez, (2018) opined management of records was crucial to effective transparency in public administrations, giving rise to quality documentation (authenticity, reliability, and integrity). In a similar vein, it should be noted that the method of electronic records creation can limit their value as authentic records. Reliability and authenticity of e- records are crucial, big conglomerates being greatly concerned have begun to make use of blockchains to manage their records (Bhatia, Douglas, & Most, 2020; National Archives and Records Administration 2019).

Increased cost: The cost of hardware and software are constantly changing this is especially true in third world economies where foreign exchange rates are in constant flux. Institutions that cannot produce this hardware and software are still faced with the challenges of purchase. Similarly, Keakopa, et al. (2009) opines companies and industries must tackle cost in two phases; during the initial purchase and when considering upgrades.

Policy on long term preservation

According to the ERPANET (2003), the primary aims of a digital preservation policy are to provide guidance and authorization on the preservation of digital materials and to ensure their authenticity, reliability, and long-term accessibility. Digital preservation policy should be directly connected to the aims and goals of the institution. A digital preservation policy would state the principles and long-term direction that would guide preservation strategies and actions.

Mohammad and Yusof (2013) pointed out that policies and frameworks act as a roadmap when implementing management procedures. Similarly, Hamidovic (2010) states the objective of the policy should be the creation and management of authentic, reliable, and usable records that are capable of supporting business functions and activities for as long as they are required. However, it should be noted that the creation of a policy does not ensure good long-term record management in organizations unless it is communicated and implemented properly.

Research Methodology

The research adopted a qualitative methodology for the exploration of digital exam records. According to Creswell & Creswell (2018), qualitative research takes place in a natural setting. Onsite appraisal often enables the researcher to be more detailed about the scenarios and involved in the actual experiences of the participants. Series of observations and interviews was the instrument used in the collection of data for the study.

The respondents comprised of staff responsible for the management of exams records in the directorate of ICT totaling three (3) individuals. in the University. A total of ten (10) interviews were conducted, the validity of the data collected was done through on-the-spot observations the process of saturation was achieved when no new information was gotten from the respondents (Bryman, 2011).

The data collected was analyzed using a simple coding system where questions formed themes and responses for each question were coded under them for ease and primarily due to time constraints.

Discussion of Findings

The data collected from the study were thematically analyzed, the theme structure was gotten from the question in the interview sessions with the staff of the directorate of ICT responsible for record management. The discussion is a narrative of these themes.

How are digital exam records managed in the directorate?

The responses obtained showed that digital exam records were managed with the use of an exam management platform which was designed by the ICT directorate Unit on a framework called CodeIgniter alongside PHP programming language. These records are manually inputted by lecturers of the University, however maintenance and preservation is handled by the ICT directorate.

This is in line with the finding of ISO, (2005); & Smallwood, (2013) on technological changes and formats which must be consistently made compatible. The preservation process is done by compressing all the records into a SQL backup file and migrating them into a hard drive. While the choice of SQL as a go-to relational database management system was good, simply because the database system had always supported backward compatibility by maintaining file formats and being stable, the mere backup of a database was not a good method of preserving files for future referencing. Archiving of the backup into a known archive format like ISO, TAR or ARC will have further prolonged the longevity of the record.

What are the challenges in rendering this system over a long time?

One major challenge to digital preservation has been the issue of obsolescence and dependence. The responses showed that despite there being a management platform for these records this was still an issue that they had been contending with, the university was currently on its third management platform due to software obsolescence. Responses showed that to tackle the issue they had previously had to migrate to different software due to technological obsolescence.

This is in line with the findings of Chigariro and Khumalo 2018 & Helfert et al. 2017 on software obsolescence within a decade. Presently they opted for open-source platforms that had shown software reliability over time (SQL database and PHP). This brought up the question of rendition platforms for old saved exam records in SQL archives, whether the new platform supports the previously stored records on SQL. The responses showed old exam record platforms upon which previous records were saved were no longer functional and had been retired.

The challenges experienced were in the rendering of old backups which had been preserved, on the new exam management platform. This is mainly because to render any old back up the environment must be like when it was initially preserved for future use. This finding is also in tandem with the statements of Fritz, (2018) on the rendering of software that has been preserved.

Was it necessary to maintain the metadata for each preserved exam record dump?

The responses showed that once the exam record had been uploaded, maintained, and reached expiry wherein it was backed up, respondents felt it was no longer necessary to maintain its metadata. According to them, the material being stored was not object-oriented like a document or picture where descriptive or structural metadata was necessary. This view is not necessary valid because the backup might contain all structural metadata necessary,

however descriptive information that relays information on the software version, date of the backup (for recency purposes) is also very important. Such descriptive metadata is helpful when records need to be rendered in the future, they serve as guides to easy and effective retrieval of records. This view is in line with that of Dappert & Enders, (2010) where they highlighted the need for metadata in digital preservation as a buffer for the lack in specifications for digital assets.

What other storage platforms are these backups saved aside from hard drives and pen drives?

Responses obtained showed that storage was done primarily on the hard drives and pen drives were used to move new records to the hard drive. Storage on hard disk drives was dependable as hard drives had a longer shelf life of 3 to 5 years and were readily available whenever needed if stored under the right conditions. the finding is similar in view to that of Kumar & Singh (2019) which recommends different storage media dependent on its utilization.

The data further revealed that these hard drives and pen drives did not have a specific location within the directorate where they were safely kept, this meant that the drives were constantly moved which might result in damage. Other platforms such as cloud-based systems were not fully utilized despite knowledge of these alternative sources. This was due to fear of compromise or changes in company policies that might affect the integrity of these backups.

Is there a digital preservation policy available for the University?

The data revealed that there was no digital preservation policy on the ground for the university at the time of the interviews. Having no preservation policy meant that there was no structured road map for the preservation of records in the University. This is in line with the opinions of Mohammad and Yusof (2013) where they emphasized having policies when implementing management procedures for the long-term preservation of records.

Summary of Major Findings

1. A management platform was designed for exam records and backup of SQL records files was done and stored on Hard disk drives
2. Challenges to old backups from old exam record systems were rendition of the backup systems for accessibility.
3. Metadata structural maintenance to records backed up was not done as they were no longer like object files that could lose their structure while in the backup state
4. Other platforms such as cloud-based services were not used to store the backups due to fear of changes in company policies
5. There was no digital preservation policy implemented at the university

Conclusion

The study showcased the issues identified in the Federal University Lokoja concerning the exam record platforms. In a bid towards understanding the preservation processes of these pieces of information materials. The importance of digital preservation cannot be over emphasized as it is the only way of securing records for future use and access in the University system. The study found that the preservation of records in the University was skeletal and the university needed a policy.

Recommendations

The recommendations for the study are as follows;

1. The study recommends the current management platform be maintained and a continuance of the present preservation format of the records.
2. A system should be put in place that is like the previous or old record structure wherein the old backup could be retrieved and accessed easily.
3. Metadata structural maintenance is very necessary for nomenclature purposes and ease in recognition in the future and hence should be done for all backups
4. Solid-State drives should be utilized since they have fewer moving parts than Hard disk drives and Cloud-based platforms for preservation should be adopted after considering the company policy on risks, accessibility, and reliability.
5. A digital preservation policy strategy should be designed and implemented that will showcase the universities guidelines, strategies and rules regarding everything preservation of records including backup and scheduling of these backups.

References

- Asogwa, B.E. (2012). The challenges of managing electronic records in developing countries: Implication for records managers in Sub Saharan Africa, *Records Management Journal* 22 (1): 198-211
- Atulomah B. C. (2011) Perceived Records Management Practice and Decision-making Among University Administrators in Nigeria. *Library philosophy and practice* <http://unlib.un/.ed/ipp>
- Bhatia, S., Douglas, E. K., & Most, M. (2020). Blockchain and records management: disruptive force or new approach? *Records Management Journal*, 30(3), 277–286. <https://doi.org/10.1108/RMJ-08-2019-0040>
- Bryman, A. (2011). Triangulation. *Encyclopedia of Social Science Research Methods*, 1966, 1–5. http://www.sagepub.com/chambliss4e/study/chapter/encyc_pdfs/4.2_Triangulation.pdf
- Casadesús de Mingo, A., & Cerrillo-i-Martínez, A. (2018). Improving records management to promote transparency and prevent corruption. <https://doi.org/10.1016/j.ijinfomgt.2017.09.005>
- Chigariro, D. and Khumalo, N. B. (2018), "Electronic records management research in ESARBICA: a bibliometric study", *Records Management Journal*, Vol. 28 No. 2, pp. 159-174
- Chinyemba, A & Ngulube, P. (2005). Managing records at higher education institutions: a case study of the University of KwaZulu-Natal, Pietermaritzburg Campus. *South African Journal of Information Management* 7(1). Available from: <https://www.researchgate.net/publication/274952556> An exploration of records management trends in the South African public sector. Accessed Sep 13, 2021.

- Creswell, J. W., & Creswell, D. J. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications Inc.
- Cox, R. J. (2018). Appraisal and the future of archives in the digital era. *The Future of Archives and Recordkeeping*, 217–242. <https://doi.org/10.29085/9781856048675.012>
- Dappert, A., & Enders, M. (2010). Digital Preservation Metadata Standards. *Information Standards Quarterly*, 22(2), 4. <https://doi.org/10.3789/isqv22n2.2010.01>
- ERPANET. (2003). *Digital Preservation Policy Tool Introduction and scope*. Available at: <https://www.erpanet.org/guidance/docs/ERPANETPolicyTool.pdf>
- Fritz, A. (2018), "From Collection Silos to Digital Content Hubs: Digital Project Management in Special Collections and University Archives", *Project Management in the Library Workplace (Advances in Library Administration and Organization, Vol. 38)*, Emerald Publishing Limited, Bingley, pp. 187-198. <https://doi.org/10.1108/S0732-067120180000038014>
- Gbaje, E & Mohammed, Z. (2013). Digital preservation policy in National Information Centres in Nigeria. *The Electronic Library*. 31. 10.1108/EL-01-2012-0011.
- Hamidovic Haris. (2010). An Introduction to Digital Records Management. *ISACA Journal*, 6, 1–6. <http://www.isaca.org/Journal/Past-Issues/2010/Volume-6/Pages/An-Introduction-to-Digital-Records-Management.aspx>
- Helfert, M., Reinholdtsen, P. and Sødning, T., (2017), "Information Quality Challenges for the Preservation of Norwegian", Position papers of the Federated Conference on Computer Science and Information Systems, Vol. 13, pp. 171–176. DOI: 10.15439/2017F549
- ISO. (2005). Long-term preservation of electronic document-based information. Available at: <https://www.iso.org/obp/ui/#iso:std:iso:tr:18492:ed-1:v1:en>
- Iwhiwhu, B. E. (2011). Electronic records management in Africa: Problems and prospects. Retrieved from <https://www.igi-global.com/chapter/electronic-records-management-africa/45385>
- Keakopa, S., Millar L., O'Shea, G., Nordland, L.P., Suderman, J., (2009) Understanding the context of Electronic Records Management. Training in Electronic Records Management. International Records Management Trust.
- Kumar, D., & Singh, M. (2019). Western digital hard drive color differences. *International Journal of Research and Analytical Reviews*, 6(September), 1–6.
- Masenya, T. M., & Ngulube, P. (2021). Digital preservation systems and technologies in South African academic libraries. *SA Journal of Information Management*, 23(1), 1–11. <https://doi.org/10.4102/sajim.v23i1.1249>
- Mohammad, N., & Yusof, Z. M. (2013). Nurturing knowledge management initiative base on students' electronic records: A study in vocational colleges in Melaka and Negeri

Sembilan zones. *International Conference on Research and Innovation in Information Systems, ICRIS*, 236–240. <https://doi.org/10.1109/ICRIIS.2013.6716715>

Mukred, M, Yusof, ZM (2015b) The Role of Electronic Records Management (ERM) for supporting Decision making Process in Yemeni Higher Professional Education (HPE): A Preliminary Review. *Jurnal Teknologi* 73(2): 117–122.

National Archives and Records Administration (2019), Blockchain White Paper, available at: www.archives.gov/files/records-mgmt/policy/nara-blockchain-whitepaper.pdf (accessed 15 November 2019).

Rahman, M. H. (2021). The new trend for digital record management in Bangladesh University Libraries. *Library Philosophy and Practice*, 2021(January), 1–12.

Rosenthal, D.S.H., Robertson, T., Lipkis, T., Reich, V. and Morabito, S. (2005) Requirements for digital preservation systems: a bottom-up approach. *D-Lib Magazine*, 11(11). [Online]. <http://www.dlib.org/dlib/november05/rosenthal/11rosenthal.html>.

Sambo, A. S., Urhefe, E. A. & Ejitaga, S. (2017). A survey of digital preservation challenges in Nigerian libraries: Librarians' perspectives. *International Journal of Digital Curation*, 12 (1), 117-120. DOI: 10.2218/ijdc.v12i1.426, Retrieved from <http://dx.doi.org/10.2218/ijdc.v12i1.426>

Smallwood, R. F. (2013). *Managing Electronic Records: Methods, best practices and Technologies*. Wiley.

Yusof, Z.M & Chell, R.W (2000). The records life-cycle: an inadequate concept for technology-generated records. *Information Development*. (16) 3 135-141