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Problems and Challenges in the Preservation of Digital Contents: An Analytical Study

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Abstract

This paper probed the issues and changelogs related to the preservation of digital contents. A literature-based approach was adopted to identify the major problems related to the preservation of these unique contents. After studying the literature, it was identified that basic principles that should be kept in mind while preserving digital contents are longevity, selection, quality, integrity, and accessibility. It was found that the most critical problems and challenges faced during the digital preservation including nature of the contents keeping the data, maintaining trust in the data, coping with the data deluge, technological obsolescence, media fragility, lack of expert and copyright & intellectual property right issues, etc. It was concluded that the libraries, archives, and information centers should be equipped with ICT facilities, and the staff has the necessary skills to handle the management of digital resources and their preservation. Moreover, sufficient funds should be allocated for the procurement and preservation of digital objects.

Keywords: Digital Contents, Digital Preservation, Problems of Digital Preservation, Principals of Digital Preservation

Introduction

Developments in science and technology bring on changes in every sector. We used to communicate by writing letters in the past. However, technology has transformed that medium into the telephone, mobile phone, and, more recently, the internet, which allows us to make video calls. Previously, all library activities (acquisition, classification, cataloging, management, storing, retrieving, and disseminating, among others) were performed manually by librarians, but now information and communication technologies are used. As computing and library technology enhance library services, printers and scanners are utilized to produce copies of

digital documents. We face some problems and challenges in preserving printed material, such as preservation of knowledge and skills, space constraints, and so on. While there are also problems and issues when it comes to preserving digital content, such as hardware, software, expertise, and so on.

Information and Communication Technologies (ICT) is a diverse set of technological tools used to communicate, create, manage, store, and disseminate information (Blurton, 1999). The use of computers and communication technology facilities the libraries and LIS professionals. ICT devices and applications are used in librarianship for acquiring, organizing, storing, retrieving and disseminating of information (Thanuskodi, 2011).

In 1972 when the internet was developed, e-mail was used as a communication tool; three years later, a listserv was also developed in 1975, which was an application used for distributing messages among the subscribers. The World Wide Web (WWW) emerged in 1991, which is a milestone in the computer and internet industry, and thus the world becomes a global village (Preece, Maloney-Krichmar & Abras, 2003). With the emergence of WWW, several internet-based applications and tools emerged and developed, including search engines, websites, databases, social networking sites, etc. Through websites and such like other media, people used to share information in the form of text, audio, video, photographs etc.

Concept of Preservation and Digital Preservation

Preservation is defined as “the branch of library and information science concerned with maintaining or restoring access to artifacts, documents and records through the study, diagnosis, treatment and prevention of decay and damage. It should be distinguished from conservation which refers to the treatment and repair of individual items to slow decay or restore them to a usable state. Conservation is occasionally used interchangeably with preservation, particularly outside the professional literature” (Reitz, 2004).

Even though preservation as a formal service in libraries and archives dates from the twentieth century, it was also practiced in many ancient libraries. Various methods have been used in many ancient societies to protect books and manuscripts from insects, fire, and decay.

Digital preservation, as defined by Tiwari (2015), refers to the maintenance of digital content. Digital preservation is a collection of processes, activities, and digital information management practices that are implemented over time to ensure long-term accessibility of digital

information. The term "digital preservation" refers to a set of policies, strategies, and actions that ensure long-term access to digital content (Dappert & Farquhar, 2009).

The Library of Congress defines digital preservation as “the active management of digital content over time to ensure ongoing access” (<http://www.digitalpreservation.gov/about/>). Digital preservation is a set of coordinated activities that ensures that digital materials can be accessed for as long as they are required (Deegan & Tanner, 2006).

Emergence of Digital Content

The late twentieth century saw a tremendous expansion of knowledge. This expansion of knowledge has resulted in the publication and distribution of information in all disciplines. This was also the era of the digital revolution in the world. The emergence of computers has resulted in the discovery, retrieval and creation of new information in all fields. Early digital work allowed for quantitative analysis of political, social, and economic processes by digitizing and sorting numbers from computers. In the 1980s, electronic text, hypertext, and the start of e-mail arrived; in this period, computers were used for digitizing and linking documents. The internet was developed in the 1990s when computers began digitizing images and manipulating visual data. The products that are available in digital format are referred to as "digital content." It refers to music, data, and images that are available for download or distribution on digital media. These materials are saved in a specific format on digital or analogue storage (Mullan, 2011).

Be-digital and born-digital content are the two forms of digital content. Be digital content is information that has been converted from analog to digital via reproduction methods such as rekeying or scanning. The term "born digital" refers to content created and developed in digital form using some technology. Libraries obtain digital resources through various methods, including purchasing digital content directly from publishers and vendors. Furthermore, libraries and organizations all over the world are working on projects to convert their analog collections to digital formats to improve access.

Why is Digital Preservation Important for Organizations and Libraries?

Traditional libraries are rapidly evolving into digital libraries, if not entirely, then at least in part. Digital preservation is the process of storing data in digital form in order to ensure the information's usability, durability, and intellectual integrity. Information technology is employed in the production, distribution, and storage of data (Najar & Wani, 2019).

The main goal of digital preservation is to keep digital content safe and accessible for a long time; other objectives are.

- To protect and allow access to the original format of information
- To ensure the authenticity of preserved digital materials
- Preventing physical media damage and deterioration through environmental control
- To undo damages, if possible
- To avoid data loss
- If and when digital materials need to be changed to preserve their intellectual content
- To implement security measures that protect digital data

Principles of Digital Preservation

The basic principles employed for preserving digital material are like those principles that apply to the preservation of analog/traditional ones. Conway (1996) defined five principles for preservation, including “longevity, choice or selection, quality, integrity, and accessibility that is being practiced for the preservation of analog media and can be extended to digital preservation”.

Longevity

Longevity means long life or long-lasting. The longevity of digital contents is determined by the life of the hardware and software used for storage and retrieval of digital data. Digital data do not exist forever due to the fragility of digital works. To ensure continuous access and availability of digital information, migration of digital contents should be done on a regular basis.

Selection

Selection plays a significant role in the success of the preservation plan. Whether it is selecting material for preservation or selecting tools and technology, or selecting media and formats, selecting digital content for preservation should reflect the broader institutional mission.

Quality

The quality of digital material is determined by the accessibility and usefulness of digital content, which is primarily governed by the limitations of capture and display technology. There are limitations to the printing and display technology used for the preservation. As a result, such devices should be used for storage in order to ensure the quality of the data stored when it is later used (Conway, 1996).

Integrity

The physical and intellectual integrity of digital content are both important considerations in digital preservation. Digital preservation measures the physical integrity of digital resources through loss of information when a source is created and compressed mathematically to store or transmit via network technology (Lynch, 1994). The information management can maintain control over the integrity of digital resources by authenticating access processes and documenting successive modifications to a digital file.

Access

Information technology equipment provides a preservation solution for the documents of libraries and other important organizations, as well as institutions with escalated access to them across multiple data networks. When it comes to storing valuable digital content, the most important factor to consider is granting access to that content. The purchase of common hardware and software will ensure that digital content can be accessed indefinitely.

Digital Preservation Strategies

Velmurugan (2013) mentioned three types of strategies for the preservation of digital objects. These are long-term strategies: maintaining continuous access to digital materials or ensuring that the information contained in them is accessible indefinitely. Medium-term strategy: gives access to digital materials for a set period of time, but not indefinitely. Short-term strategy: Access to digital materials is provided for a set period of time while use is anticipated, but it does not extend beyond the foreseeable future until it becomes inaccessible due to technological changes.

Issues and Challenges in Digital Preservation

As digital technology offers many advantages over the printed one. Information technology, as well as other related technologies such as the internet and web, are always changing. It is difficult for libraries and information resource centers to keep up with the rapidly changing technology involved in digital preservation. Early on, a thorough examination of the risk factors associated with digital preservation should be identified to assess their potential impact. Different scholars identified various issues and challenges regarding the preservation of digital content.

The issues and challenges regarding the preservation of digital content were mentioned by researchers, including Arora (2006), Rahman and Mezbah-ul-Islam (2012), and Velmurugan (2013). These issues and problems are discussed as under.

Nature of Digital Contents

Chen (2001) stated that the most serious issue with digital preservation is the content itself. Digital information exists in various types and formats. The majority of objects that are exact replicas of their print documents (such as books, reports, correspondence, and so on, can be converted into e-documents and preserved easily. However, materials such as interactive web pages, geographic information systems, and so on that cannot be replicated in traditional hard copy may pose challenges for libraries and information centers in terms of preserving these objects.

Fragility of the Media

Fragility means the quality of something that is quickly deteriorated or broken. Digital content storage media are highly unstable and fragile because they can deteriorate and fail due to heat, humidity, airborne contaminants, or faulty reading and writing on devices (Hedstrom & Montgomery, 1998). The most common issue with digital preservation is media failure or deterioration, as well as rapid changes in computer hardware and software that make older systems obsolete.

Machine Dependency

Digital contents are machine-dependent and necessitate specialized hardware and software for data storage and retrieval. However, because the computer (hardware and software) and storage technologies are constantly evolving, the storage equipment must be changed and upgraded accordingly. Otherwise, it could pose the greatest technological threat to the continued availability of digital content.

Maintain Digital Objects

When a document is converted into digital form, then protecting that digital content from altering and deterioration becomes the focus point. In some cases, digital objects had a short life span as compared to hard copy (printed copy). It can be a problem for the concerned to preserve objects of such file formats.

Formats and Styles

Information that was once limited to the traditional types, including monographs, cartographic materials, charts, graphic contents, etc., but now there are variety of digital contents available in various formats. Hypertext, multimedia, dynamic pages, geographic information systems, and interactive video are just a few examples of new formats that have been emerged. The encoding, compression, and storage of these file formats or styles present numerous challenges to libraries and information centers.

Lack of Experts

The digital preservation process requires trained and technologically competent staff to manage the resources properly. However, getting such experts often becomes difficult.

Improper Budget

As digital preservation requires the latest and sophisticated technology and experts who require additional expenditure for the concerned organization; but if the organization did not provide a sufficient budget, the whole digital preservation project would be hampered.

Copyright and Intellectual Property Rights (IPR)

The impact of intellectual property rights (IPR) on digital preservation is significant. The intellectual property rights (IPR) issues for digital content are more complex than those for printed material. IPR problems in the digital world apply not only to digital content but also to all related applications. A digital library which offers its resources on the internet is where you can preserve and loan what others have produced, but through the stroke of your digital presence you can create new copies of their original digital content.

Some problems regarding the preservation of digital content were also explored by the Digital Preservation Coalition (2015), these are described in the following section.

Keeping the Data (To store Data)

Data storage on some storage media may be a problem since some media degrade over time. A systematic preservation process is a must for ensuring long-term digital preservation. Storage media must be observed, monitored, and refreshed on a regular basis. The introduction of redundancy through file replication or backup, the introduction of diversity in dependent technologies, and the prevention of catastrophic disasters at a single geographical location—the locations in which digital materials are stored, as well as the responsibility for maintaining them, should be meticulously recorded and assigned.

Keeping the Meaning of the Data

Information reconstruction usually requires the use of computer software that can render, manipulate, and interact with the data's encoding or format. The formats of files may change over time and the interacting software applications may become obsolete. It may be possible to render an old file format by emulating some obsolete software, but whether running the software is legal, how accurate the rendering will be, and how much will this cost are all questions that need to be answered.

Maintaining Trust in the Data

Digital materials may remain fluid in the long term, edited or altered easily, damaged by media failure, or inaccurately or inconsistently decoded into human-readable information through rendering software. For an end user to rely on the digital preservation work, carefully considering the complete life cycle of digital materials and who or what has interacted with them over time. The use of the data integrity method and the preservation of assessment trails can ensure that the digital object has not changed since it was stored in the archive. Finally, the overall fidelity of the preservation organization may influence a user's perception of its authenticity.

Acting in a Timely Manner

It means that digital objects should be preserved in such a way that users can get the most out of them in the least amount of time. Prioritizing and carrying out digital preservation activities on time may be necessary to avoid losses and make the best use of resources.

Coping with the Data Deluge

According to David Rosenthal's research report, "the rate of data generation is increasing by about 60 per cent per year; data storage is increasing by about 25 per cent per year, and data center budgets are increasing by about 2 per cent per year" (Baker et al., 2006). This report shows that the rate of data creation is much greater than the volume of storage. The effectively functioning of simple preservation processes will not necessarily scale easily to work with a data deluge or perhaps huge individual files. The administrative and technical challenges of acquiring, managing, and providing access to digital materials on such a large scale should not be overlooked. It is necessary to note that selection, acquisition, accessioning, assessment, and disposal are essential elements in any digital management practice.

Conclusion

In the age of Science and Technology, the preservation of documents is now facilitated by Information technology known as digital preservation. This paper is based on previously published literature. After studying the literature, it was concluded that basic principles must have to keep in mind in preserving digital contents are longevity, selection, quality, integrity, and accessibility. It was seen that the most critical problems/challenges faced during the process of digital preservation such as; nature of the contents (i-e; “made digital” or “born digital”); keeping the data; maintaining trust in the data; coping with the data deluge; technological obsolescence; media fragility; lack of expert and copyright and Intellectual Property Rights and information centers with the necessary skills to handle the management of digital resources and its preservation.

References

- About digital preservation. Library of Congress. <http://www.digitalpreservation.gov/about/>
- Arora, J. (2006). Digital preservation and management: an overview. *Paper presented at the 4th Convention PLANNER -2006, Mizoram University, Aizawl,, INFLIBNET Centre, Ahmedabad.*
- Baker, M., Shah, M., Rosenthal, D. S., Roussopoulos, M., Maniatis, P., Giuli, T. J., & Bungale, P. (2006). A fresh look at the reliability of long-term digital storage. *Paper presented at the Proceedings of the 1st ACM SIGOPS/EuroSys European Conference on Computer Systems 2006*
- Blurton, C. (1999). New directions of ICT-use in education. *UNESCO's World Communication and Information Report New York*
- Chen, S.-S. (2001). The paradox of digital preservation. *IEEE, 34(3), 24-28.*
doi:<https://doi.org/10.1109/2.910890>
- Digital Preservation Coalition. (2015). Digital preservation handbook. *In: Digital Preservation Coalition York (UK).*
- Conway, P. (1996). Preservation in the digital world. *The Commission on Preservation and Access, Washington, DC*
- Dappert, A., & Farquhar, A. (2009). Modelling organizational preservation goals to guide digital preservation. *The International Journal of Digital Curation, Vol 4(No 2).* doi:
<https://doi.org/10.2218/ijdc.v4i2.102>
- Deegan, M., & Tanner, S. (2006). Digital preservation. *Facet Publishing, London*
- Hedstrom, M. L., & Montgomery, S. (1998). Digital preservation needs and requirements in RLG member institutions. *Research Libraries Group Mountain View, California, USA.*
- Lynch, C. (1994). The integrity of digital information: Mechanics and definitional issues. *Journal of the American Society for Information Science, 45(10), 737-744.*
- Mullan, E. (2011). ["What is Digital Content?"](#). *EContent Magazine. Information Today Inc*
- Najar, Jaffer Kabir and Wani, Javaid Ahmad. (2019). Digital preservation: an overview. *Library Philosophy and Practice (e-journal).* 2989.
<https://digitalcommons.unl.edu/libphilprac/2989>
- Preece, J., Maloney-Krichmar, D., & Abras, C. (2003). History of online communities. *Encyclopedia of community, 3(1023-1027), 86.*

- Rahman, M., & Mezbah-ul-Islam, M. (2012). Issues and challenges for sustainable Digital Preservation Practices in Bangladesh. *Paper presented at the International Seminar on 'Digital Libraries for Digital Nation'*, Bangladesh.
- Reitz, J. M. (Ed.) (2004) Dictionary for library and information science. *Libraries Unlimited westport, A member of the Greenwood publishing group Inc. USA*
- Thanuskodi, S., & Ravi, S. (2011). Use of digital resources by faculty and research scholars of Manonmaniam Sundaranar University, tirunelveli. *DESIDOC Journal of Library & Information Technology, 31(1)*
- Tiwari, P. (2015). Digital preservation and digitization. *APH Publishing Corporation, New Delhi*
- Velmurugan, C. (2013). Digital preservation: Issues and challenges on libraries and information resource centres in India. *e-Library Science Research Journal, Vol.1(Issue. 8).*