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ARCHIVES AND THE DIGITAL AGE

ABSTRACT

This study explains the impact of digital age technologies on the archival science, and how we can enable these technologies to ensure the basic requirements needed for long-term digital preservation which is the key target towards the implementation of modern digital age archive. These basic requirements are: Accessibility, Applicability and Understandability, Authenticity, and Integrity. The method, approach used in this study is reviewing and reading different literatures in which it was demonstrated the benefits and the challenges of digital archive practices. Also highlighting Oman national archive approach in Data Management long term preservation. This study shares the views that digital technologies play a major role in archiving today and undoubtedly have a great impact on the basic functions of archives and the new methods that the archivist adopts in dealing and benefiting from these technologies.

The results of this study shares the thoughts that technologies related to digital archives are changing rapidly, and archiving institutes and archivists are required to deeply understand these technologies and make the most of it, to preserve the principles and the concepts of archival science.

Key words: Archival science, Digital preservation, Organizational strategy, Technical Strategy, and Long-Term Preservation.

ARCHIVI E L'ERA DIGITALE

SINTESI

Questo studio spiega l'impatto delle tecnologie dell'era digitale sulla scienza archivistica, e come sia possibile consentire a queste tecnologie di garantire i requisiti di base necessari per la conservazione digitale a lungo termine, che è l'obiettivo chiave verso l'implementazione dell'archivio moderno dell'era digitale. Questi requisiti di base sono: accessibilità, applicabilità e comprensione, autenticità e integrità. L'approccio utilizzato in questo studio è quello di rivedere e leggere diverse letterature in cui sono stati dimostrati i benefici e le sfide delle pratiche di archiviazione digitale, evidenziando anche l'approccio dell'Archivio nazionale dell'Oman nella conservazione a lungo termine e della gestione dei dati. Questo studio condivide l'idea che le tecnologie digitali svolgano un ruolo importante nell'archiviazione moderna, e senza dubbio hanno un grande impatto sulle funzioni di base degli archivi e sui nuovi metodi che l'archivista adotta nel trattare e beneficiare di queste tecnologie. I risultati di questo studio condividono il pensiero che le tecnologie legate agli archivi digitali stiano cambiando rapidamente, e gli istituti di archiviazione e gli archivisti sono tenuti a comprendere a fondo queste tecnologie e a valorizzarle al meglio, per preservare i principi e i concetti della scienza archivistica.

Parole chiave: archivistica, conservazione digitale, strategia organizzativa, strategia tecnica, conservazione a lungo termine.

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ARHIVI IN DIGITALNA DOBA

IZVLEČEK

Ta študija pojasnjuje vpliv tehnologij digitalne dobe na arhivsko znanost. in kako lahko tem tehnologijam omogočimo, da zagotovijo osnovne zahteve za dolgoročno digitalno hrambo, ki je ključni cilj pri ustvarjanju sodobnega arhiva digitalne dobe. Te osnovne zahteve so: dostopnost, uporabnost, razumljivost, pristnost in integriteta. Metoda in pristop, uporabljen v tej študiji, je pregled in branje različnih literatur, v katerih so predstavljene dobre prakse in izzivi digitalnega arhiviranja. Poudarjajo tudi pristop nacionalnega arhiva Omana pri dolgoročnem ohranjanju upravljanja podatkov. Ta študija deli stališča, da imajo digitalne tehnologije danes pomembno vlogo pri arhiviranju in nedvomno močno vplivajo na osnovne funkcije arhivov in nove metode, ki jih arhivar sprejema pri obravnavanju in izkoriščanju teh tehnologij.

Rezultati te študije delijo misli, da se tehnologije, povezane z digitalnimi arhivi, hitro spreminjajo, in arhivske inštitucije ter arhivisti morajo te tehnologije globoko razumeti in kar najbolj izkoristiti za ohranitev načel in konceptov arhivske znanosti.

Ključne besede: arhivistika, digitalna hramba, organizacijska strategija, tehnična strategija in dolgoročno hramba.

1. INTRODUCTION

There is no doubt that the appearance of modern technologies specifically in the field of digital information has imposed the necessity to reconsider the old and traditional concepts of Archival Science. This has affected the various aspects of the known archiving functions, which include identifying archival materials, methods of obtaining them from various institutions or individuals, structuring and classifications of the records, storing, processing, managing and making them available to researchers, individuals, and specialists. The effect of digital technologies on the archives and how it has improved its core principles will be highlighted in detail in this paper and the strategies required to be implemented in order to establish a long-term digital preservation that include the basics of Applicability, Understanding, Authenticity, and Integrity.

2. ARCHIVES AND THE MODERN TECHNOLOGIES

Despite the changes and the development over the time, the main purpose of the archives all over the world remains unchanged. It remains the main source of nation's memories, and it remains the main source for researchers and those who document the history wherever and in whatever type it is. However, the science of archiving has faced many challenges in dealing with new technologies, and as per Ivan Szekely *"archives have gone through considerable changes, facing numerous challenges along the way. These changes have affected archival science and practice alike. Even in the recent past, a host of new archival concepts have emerged. Eric Ketelaar writes of archival turns extending beyond the boundaries of archival science"* Ivan Szekely, 2017, pp1.

However, challenges will always be there to achieve the best practices as per the stages mentioned above. It will remain the concern of the archivists around the world particularly with the appearance of new, fast, and dramatically changing technologies as humanity entering the digital era. Hence, and in order for nations to preserve the main function of the archive and to perform its services at all times to the fullest extent, some adjustments have to be made to the traditional archiving concepts and methods, thus to

cope with the digital technologies. Archivist must ensure that these types of technologies are understood and well-handled to preserve archival material in good conditions and for as long as possible.

Since many years ago specialists in the area of archives have learned how to preserve paper documents and physical materials in a traditional way, but due to the requirements of digital technology and the existence of new types of documents and records that comes in digital format, it was necessary to keep up the science of archives in line with the new digital age, coping with the vast amount of data that are generated every day and how to distinguish what needs to be archived and managed and what is not necessary. Also, it was necessary to develop Metadata which can include classification, coding, descriptions or any other important characteristics required to the archival materials. In addition, archive specialists should come up with new methods and concepts to protect this type of archive material, that can be done by laying the foundations , mechanisms and process such us the informational packages (SIP, AIP, DIP), to provide the appropriate environment and allow sharing it with the archival institutions and with those who need it.

Consequently, and with these new methods that need to be taken by the archives, many specialized companies in recent years have innovated equipment's and programs that supports archivists, equipment's and programs that allows archivists to convert physical documents into digital format. For example, digital scanning devices appeared, which allowed archivists to convert paper documents into digital format documents and save them in specialized programs such as the Electronic Document Management Systems EDMS programs that allowed storing them for long-term preservation and search through. These programs not only help archivist to store documents, but also to manage them perfectly and as required based on the standards and the specification given by the archive authorities. These technologies have also become extremely important in preserving old type of manuscripts and protecting the original documents and records from damage. It also allowed viewing them by a wide range of researchers within a reasonable time frame.

3. DIGITAL PRESERVATION STRATEGY

It is required for the archives to establish a digital preservation strategy before undertaking the implementation of any digital projects, to maintaining the basic requirements for long-term digital preservation which are Applicability, Understanding, Authenticity, and Integrity. And to achieve this goal archives shall depend on appropriate standards, specifications, proper tools and well-trained staff to ensure all archival materials are preserved for long terms and can be accessed and used whenever they are required. This strategy can be split in two main strategies Organizational and Technical strategies, details are as follows:

A) **Organizational strategy:** It relates to the administrative aspects required to implement the strategy including budget saving, training, establishment of policies, standards and procedures related to technical aspects. In this strategy the following important elements should be considered

- Establishments of digital archive policies and standards:

Archival centers should be aware that sitting up Policies and Standards is an important aspect and should always come first whenever planning or establishing a system for shifting from physical to digital format. This will help archive institutes setup policies and objectives and manage the archive materials in a professional and reliable way for long-term preservation.

Currently there are many international standards, that can help archive institutes to implement the highest standards such as ISO 13008:2012 Information and documentation (Digital records conversion and migration process), ISO 13028 Information and documentation guidelines for digitization of records, and ISO 14721:2012 Space data and information transfer systems - Open archival information system (OAIS)-reference model, and many others

Moreover, national, and/or local standards, guidelines, and tools can be used too in this regard. In general, whatever policies and standards used, the archive institutes should include the following elements:

- Creating and managing digital records
- Storing digital records
- Transferring digital archives to the Archives Authority (records migration)
- Preserving and using digital archives
- Training and new capabilities for Archivists:

With the emergence of new technologies, archivists are required to acquire new skills to deal with digital archives. Also, new jobs and specializations will be needed to the archive related to information technology and how to deal with the vast number of electronic data and information. This to ensure is preserving the archive materials, maintenance and follow up on the validity of the systems.

B) **Technical Strategy:** Relates to the technical aspects that should be undertaken to ensure usability and availability of digital materials whenever technological changes occur. With this strategy the following important elements should be considered:

- Preservation of physical copies

Users sit in front of their laptops, computers, mobiles to view different types of documents and archival materials from their office, home, or anywhere else, as they view these materials with high resolution, check the details and the color depth, they can zoom in and out, scroll up / down the images, and search for words within the documents or the archival materials, these all happens easily and fast. All this would not been possible if there were no digitization technology present as it now. This technology has helped the archives centers and the users at the same time, it helps the archives centers to protect the original copies, save its details, and provide access to these materials to many users depending on their mandates. It also helps users as these archival materials become much easy to find though libraries, internet and from anywhere in the world and with a click of a button.

- Technology and digital preservation

It is a series of measures needed to ensure that digital information or archival materials are remains accessible and usable whenever necessary. It combines policies, strategies, and procedures to ensure accessibility, usability of digital content regardless of the challenges to media failure and technological change. The goal of digital preservation is the accurate extraction of reliable content over time, considering migration of Information and data from one electronic system to another. This require a continuous intervention and it should be conducted every few years, depending on the setting policies, to ensure that the system updates the associated programs and devices.

Moreover, one of the key elements for digital preservation is creating a proper Metadata, which includes technical information for digital objects, information about a digital object's components and its computing environment. It allows organizations or individuals to understand deeply the digital information

Backing up regularly is an important element for digital preservation that needs to be considered too, data of the archival materials backups should be checked and ensured that they are safe, that can be done for example by keeping multiple copies in distributed storage.

- Migration of information / documents

As we know Migration is the act of moving records from one system to another, while maintaining the records' authenticity, integrity, reliability, and usability. Therefore, archival institutions must ensure that whenever documents or archival materials are migrated, they shall be migrated with their full context and their digital contents completely and correctly without any loss of their Metadata.

This kind of strategy requires transferring information or data in every period to other media that works with the new generation of technology, thus, to ensure these digital archival materials can be accessed and used with whatever new technology appears.

4. THE EFFECT OF THE INTERNET ON THE ARCHIVES

Having a website on the internet has become a necessity for any organization that wants to succeed, archives institutions do not deviate from this rule in their works. The Internet has provided easy access to archival materials and for a vast number of users around the world, from the internet users can view, download documents, discuss and many other services that the internet can provide. The Internet has shifted the archives to a new level that has never been possible as it is now. It has moved the archive center to a level of information center and libraries. And below list the most important services provided by the Internet that archives institutions benefit from:

- Browsing websites.
- E-mails.
- Upload documents remotely.
- Dialogue and Instant Messaging (chat sessions).
- Electronic trade.
- E-learning

5. DIGITAL PRESERVATION CHALLENGES

Although the process of preserving archival materials and their containers are not a new challenge. This challenge has been there with the traditional archive since long ago, but the difference with the new digital age is that the challenge is taken into consideration much more than the traditional archive, this challenge can rely on several aspects, these aspects can be summarized as multiple risks on the digital information, it can go sometimes beyond the capability of one entity, for example financial issues, and also the challenge of keeping the digital preservation process running continuously.

The most important in this all, and the main purpose is to maintain the digital archival materials from loss, there are multiple reasons that can lead to digital information loss, the following are the most notable:

- Changes in the organization
- Reorganize the content
- The sponsor stops supporting the system.

- The disappearance of the technology used
- Data destruction, or damage.
- Natural disasters

6. DATA MANAGEMENT FOR LONG-TERM PRESERVATION IN OMAN

In recent years many of archival materials are created in digital format under many types of software's such as PDF, TIF, Microsoft, AutoCAD drawings and Geographic Information System data (GIS). And these records are increasing continuously and dramatically every year. Therefore, government establishments and companies in Oman which are falling under the regulations of National Archive authority (NRAA) must implement the appropriate policies, standards, and procedure in line with NRAA requirements to ensure long-term preservation for its digital records and to adjust its strategy with the Oman National Archives.

The classification scheme and retention schedule issued by NRAA which describe the titles, function and content and the retention for the digital documents are important because its helps Oman archive institutes and companies to understands the whole life cycle of its documents.

6.1 Life cycle for the digital records

The life cycle for the digital records starts in all governments establishments and companies owned by governments in Oman according to NRAA from the creator who creates or captured the records, these records remain in the electronic system (EDRMS) during their active period, after this period and when the records becomes inactive, these records are transferred from being active records to another form of record status in which they are known as current documents for a period of time according to the retention schedule which was approved by NRAA. After this period, the records will move from being Current records to Intermediate records in which they are archived in the company storage area for a period as well, and according to the approved retention schedule. At last, the records which are selected for permanent archive will be transferred to NRAA. The choice of which disposition whether they are due to destruction, permanent archives, or transfer of selected samples these actions to execute must be in accordance with the retention schedule that is applicable to those records.

6.2 Long-term preservation

To protect digital records from for long-term preservation we should first understand the risks and challenges that could occur during long-term preservation, challenges such as rapid technology development whether they are hardware become absolute or software which change faster, for instant file format. Moreover, we should also understand the issues related to storage condition like temperature, fire, floods, humidity, and dust, in which need to be controlled.

Hence, to ensure a long-term preservation it should implement seriously the following points:

- Ensure in line with international standards such as (ISO 14721 Open archival information system (OAIS) , ISO 15489 Records Management, ISO 20652 Producer-archive interface, and ISO 13028 for digitization of records, ISO 16175-2:2011 Guidelines and functional requirements for digital records management systems and ISO/IEC 14496 Information technology – Coding of audio).

- Ensure in line with NRAA requirements, laws and guideline related to E- repository
- Develop best practice; internal rules such us Risk assessment, Information security policy, Records management policy and Digital preservation policy.
- Ensuring Metadata is being used and described for all archival digital records
- Ensure staff are well trained the have the knowledge and skills to perform tasks related to digital archive.
- Ongoing intervention should be performed every 5, 10 or 20 years "depends on the setting policies in the institutes to ensure updating the system software and hardware

Ensure coordination with NRAA when developing e repository system from the beginning and ensure E- repository system is certified by NRAA.

7. CONCLUSION

We have tried in this study, to highlights the new horizons opened to the archives by the new technologies, how information and the archival materials are managed by the specialists using new supporting methods and principles. Also, tools like IT servers, software, optical discs, digitizers, and networks all were used efficiently for the benefit of the archives. We have also seen some digital preservation challenges that archivists need to focus on, by understanding them well, thus to overcome the obstacles that may prevent long-term digital preservation ensuring Applicability, Understanding, Authenticity, and Integrity. Archive institutes should always practice the best methods and concepts known and keep up to date in dealing with the changing environment of the digital age, and as said:

"There is just one conclusion to draw: if we do not manage to handle digital resources properly over time, there will be no records of today or tomorrow left for coming generations. We will get a black hole in the history book" Börje Justrell, 2018 pp.3.

Given the importance of document preservation and taking into account all the important aspects that are required in preserving digital records as mentioned in detail in this study, the question now is: to what extent can the governments that control the National Archives move to e-government. Many governments around the world are moving to e-government, but this will not be possible if some of the main principles of e-government are not considered. Important principles such as the ability to provide information transparently to all citizens regardless of age, gender, religion, color, and disability. Moreover, the accessibility of this information / archival materials every day of the week, and around the clock, regardless of where you are, or who you are, and this require effort and cost by covering internet all over the country. Also, the electronic platform of the archive web page should always be able to server everyone and adopting public services effectively that meet the needs of citizens, and this means providing integrated services through a unified electronic window.

Perhaps one of the biggest dangers facing the digital world today is the threat of hackers hacking into the information society: either for the purpose of extortion and making money; and that by destroying sites and sabotaging them by spreading various, or access to confidential files and data with intent to fraud. This is a big challenge for the National Archives authorities to ensure that all records which will be created by governments entities are classified ,coded, provided retention period and level of security before shifting them to the National Archive and then to be able to identify users and their needs, and to distinguish type of archival materials that need most to be protected, classifying these materials based on the level of record security of each Record /

Data, and setting method of protection. In addition, National archives has to ensure systems used such as EDMS are in line with their standard this is another challenging task as many government entities are not aware of the regulations from the national archive authorities , and these entities may face issues with the authorities when spend a lot of money to establish systems which are not approved by the authorities and that can be easily breached.

Therefore, procedures or technologies established by entities that their records follows the National Archive authority must be implemented effectively as required by the national archive, and as said mentioned "*Procedures and technology are the core of such a system when developing a record keeping system, one has to keep in mind that procedures and technology have to be implemented in the right perspective*". Filip Boudrez 2005 pp. 126.

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