Digital preservation of sound recordings

Perla Olivia Rodríguez Reséndiz

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Abstract

Because thousands of sounds documents are lost every day as a result of the fragility and deterioration of recording supports, and the obsolescence of analogue recording and playback equipment, the preservation of the sound archives is at a critical point in its history. Currently, the transfer of analogue content to digital platforms is the only way to guarantee the survival of sound heritage. Therefore, the preservation of digital audio files constitutes a long-term safeguard that will eventually replace analogue backup methods used to preserve the world's audio heritage.

* Instituto de Investigaciones Bibliotecológicas y de la Información de la UNAM, México. perla@iibi.unam.mx

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Resumen

La preservación digital sonora
Perla Olivia Rodríguez-Reséndiz

La preservación de los archivos sonoros está en un punto crítico de su historia debido a que día a día desaparecen miles de documentos sonoros como consecuencia del deterioro y la fragilidad de los soportes en que han sido grabados, así como por la obsolescencia de los equipos de grabación y reproducción analógica. Hasta ahora, la transferencia de contenidos analógicos a plataformas digitales (digitalización) es la única forma de garantizar la existencia del patrimonio sonoro; por ello la preservación digital de archivos sonoros constituye una forma de salvaguarda a largo plazo que ha modificado los métodos de preservación de documentos sonoros en soportes analógicos.

Palabras clave: Archivos sonoros; Preservación; Preservación digital; Preservación digital sonora; Digitalización; Documentos sonoros.

Introduction

For many years sound recordings have been a province separate from text documents. Such recordings were defined as non-library documents. This is understandable in light of the fact that sound recording is much newer than the print technology that underpins the collections of museums and libraries. Libraries only began to collect and classify audio documents in the twentieth century (Wright, 2012). In the opinion of Jean Weihs (2001), audio documents began to become ever more visible in the 1950s and 1960s in the United States and Canada. With the advent of sound recording technology, special catalogues of audio documents were implemented in libraries. Dayli (1967) showed that audio recordings require new approaches in terms of pro-

cessing, storage and cataloging. To this end, he developed a criticism of the Anglo-American Cataloging Rules. He opined that these rules were insufficient for cataloguing sound documents. Dayli's initial analysis published in 1967, established the idea that sound recordings were a distinct medium and therefore required special treatment, distinct from that afforded books.

Rousseau and Couture (1994) assert that the 1960s and 1970s constitute the period when archivists took a genuine interest in non-textual documents. According to Ávila Araujo (2013), during the 1970s the archive began to broaden in scope to include, for example, administrative, business and private files, and documents arising from new fields, such as sound recordings and microfilm. The development of archival science and the interest in sound documents coincided with the founding of the International Association of Sound and Audiovisual Archives (ISAA) in Amsterdam in 1969. The ISAA's stated purpose is to provide a forum for encouraging cooperation among archivists and librarians whose job it is to safeguard sound documents.

The interest lent to sound files in the documental field coincides with the progressive incorporation of information and communications technologies that Castells (2004) has called the "knowledge revolution," a term suggesting that information is the foundation of the information economy.

This process occurs in the context of what Vivas Moreno (2013) calls "integrated archival science in the information society," and can be understood as the period in which the discipline underwent important growth in terms of conceptual principles and implementation. These changes can be seen in the broadening and expansion of the general field of activity of archival science, which views the archive, library and documentation center and their associated processes as residing under the umbrella of information and documentation science, with the incorporation of information and communication technologies intrinsic to its practice. In the view of Vieira (2013), archival science arose at the end of the twentieth century and was characterized by the unfolding and dissemination of information and communication technologies, which led archival specialists to rethink the objects, methods, theories and concepts of the field. Consequently, the body of sound archives spurring academic, social, political and cultural reflection appears to coincide with the incorporation of information and communications technology.

Origin and development of sound recordings

With the invention by French inventor Édouard-Léon Scott of the phonautograph over 150 years ago, it was understood that sound could be recorded. Scott recorded himself singing some lyrics from *Au clare de lune* (Giovannoni, 2008). Sometime later, in 1877, Thomas Alva Edison invented the phonograph (Hill, 2012) making it possible both to record and play back recorded sound. This was the beginning of the era of audio archives and the documentation of human history by means of sound recordings.

This new audio technology captured the interest of society and drove exploration of its possibilities within the fields of science, art and entertainment. Sarmiento (2010) cites one of the earliest articles by Edison on the phonograph written in 1878, in which Edison envisions the uses of his invention, including its usage in education, recording music, creating family albums, recording and playing back books and speech, as well as its potential in the field of advertising or simply being used as a sort of music box.

Schüller (2008) points out that in the early twentieth century scientific research in the fields of dialectology, ethnomusicology and anthropology relied on sound recording technology. This led to the establishment of the first audio libraries. Founded in 1889, the first audio archive was the *Phonogrammarchiv* of the Academy of Arts and Sciences of Vienna (Miranda Regojo, 1990; Schüller, 2008). Two years later in 1900, the *Phonogrammarchiv* of Berlin was founded. This was followed by the founding of the Phonogrammarchiv of Saint Petersburg and that of Zurich in 1908 and 1908, respectively (Schüller, 2008).

The invention of portable, battery-powered recording devices supported field work and allowed researchers to record language, music and rituals all over the world. Much of our current knowledge about linguistic and cultural diversity comes from sound documents recorded over the last 50 years. (Schüller, 2008). Sarmiento (2010) has found that in the milieu of the *avant garde* in the early twentieth century, the phonogram was a key instrument for dissemination of art and prevailing ideas. Moreover, it was used in the creation of works of art.

The systematic gathering of sound documents began from 1920 to 1930. In this period, we find the first national sound archives devoted to safeguard-

ing phonographic recordings made in the early twentieth century. One of these was the *Discoteca dil Stato d´Italia* created in 1928. By the decade of the 1930s, radio broadcasts were regularly recorded (Rooks, 2010). Radio programs in the first years radio, of course, have been lost to history, since most were not recorded, largely because their value as historical documents was not widely appreciated (Rodríguez, 2012).

By 1932, the term audio library had come into use. Gabriel Timmory used the term to describe the National Audio Library of France (Bellveser, 1999; Miranda 1990). By the end of that decade, early sound collections had begun to make up part of library collections (Schüller, 2012). For example, in 1938, the National Audio Library of France became a part of the National Library of France.

The consolidation of sound and audiovisual archives began in earnest in the decade of the 1940s, with the introduction of the vinyl disc (Schüller, 2012). Klijn and Lusenet (2008) have pointed out that by the middle of the twentieth century, several national audio and film institutions had been founded.

After 1956, radio stations began to use magnetic tape to record sound. In the International Expo of Brussels in 1957, Radio France presented recording of writers' voices as a complement to the visual exhibits on display (Miranda Regojo, 1990).

Scientific research, the recording industry, radio and artistic exploration were the main tributaries feeding into the collections of the first sound archives. Of these sources, recordings of decades of radio programs are by far the largest contributors (Rodríguez, 2012).

The beginnings of analogue recording

Recordings have been made of radio broadcasts, the world's languages, the voices of important historical figures; the testimony of artists, scientists, athletes and politicians; musical genres, the audio landscape and countless other things, all of which are preserved in audio libraries that arose as the new institutions of memory based on the conceptual and philosophical principles of libraries, archives and museums, which for centuries have been the depositories of human heritage (Edmondson, 2004).

Sound recordings document or preserve material for a deliberate intellectual purpose (UNESCO, 2002) and consist of the informative content and the recording support media. The contents of a sound document are recorded to support media made from diverse materials, including wax, vinyl, plastics, acetate, paper and Bakelite. Each of these supports corresponds to a particular recording and play back technology, which has included the phonograph, gramophone, magnetic wire recorder, record player, reel to reel tape recorder, cassette tapes and the compact disc player. Recorded content and the support media had been closely associated and equally important in grooved analogue supports (cylinders, thick and narrow groove record discs, transcription, lacquered, etc.); magnetic analogue media (magnetic wire and reel to reel tape, cassette tapes), and in the first digital storage systems (compact disc, DAT, DVD and Blu-Ray) (Edmondson, 2004; Rodríguez, 2012).

It is well known that none of these supports can provide indefinite storage. As such, these supports must be safeguarded in optimal conditions in order to allow users to enjoy access and use for as long as possible (IASA, 2005). The first document processes applied to sound archives occurred in libraries, which over time began to develop specific processes for handling their collections of sound recordings.

Since the basic purpose of a sound recording is to preserve sound documents, we should be wary when terms such as conservation, preservation and restoration seems to be used interchangeably as if they were synonyms. Voutssas Márquez (2009:9) distinguishes between these concepts as follows: "…to preserve is to safeguard the long-term permanence of the document. To do this, we must conserve, i.e., use foresight to adequately and permanently protect and safeguard the document. When such documents are damaged, we must restore them." For the purposes of this paper, we shall take up the definition of preservation of sound and audiovisual archives provided by Edmondson (2004:20): "all of the media required to ensure continuous access –for all time-- of a sound or audiovisual document with the best possible fidelity." The main international sound and audiovisual archive associations, such as the International Federation of Television Archives (FIAT-IFTA), the International Association of Sound and Audio visual Archives (IASA), the Association of Archivists of Moving Pictures (AMIA), the United Nations Organization for Education, Science and Culture (UNESCO) and the Coordinating Council of Audiovisual Archive Associations (CCAAA), agree with this definition (Wright, 2012).

The preservation of analogue sound documents is associated with the physical and chemical stability of the support media. Consequently, there is an incentive to limit the public's access to such these sound archive, which is to say that conservation becomes the chief preservation measure. In this vein, ISSA (TC03-2005) states that conservation implies storing the supports in suitable environments. To this end and whenever possible or necessary, the primary information must be separated from the secondary information; and maintenance and cleaning should be performed routinely. Conservation entails shaving copies of the documents while minimizing the use of the originals or archive copies. One of the major tasks of the archive operation for conserving its collection of original material is to produce copies and make these available to the user public.

In concert with this outlook, Edmondson (2004) has stated that conservation is the set of elements needed to ensure the indefinite availability of an audiovisual document in optimal conditions. He adds that without cataloging, sound documents cannot be identified or consulted. It is well known that cataloging of sound documents is a specialized task that has its origins in the cataloging of books. Print and sound media are distinct in terms of the variety of supports, content diversity, timeliness of the information they contain and depth of analysis, and ambiguity of the document (RTVE, 1991). To these features, we can add the diverse audio playback equipment.

The antecedents of sound document cataloguing dates to 1942, when the Music Library Association issued its *Code for Cataloging Phonograph Records.* In 1995, the International Association of Sound and Audio Visual Archives (IASA) issued its cataloguing rules based on the work and experience of a team of professional sound and audiovisual archivists. This means that for a period five decades, many professionals in the field have reflected on and analyzed the features and nature of the sound documents in order to establish cataloging guidelines for such documents. Cataloging sound documents is a key process that allows retrieval of contents and permit access to them.

If there is no access to the document, the document is meaningless. Conservation and access are the two sides of the same coin (Edmondson, 2004). Access may be deemed an integral part of conservation. Access is defined as all of the uses, exhibitions or physical deliveries, which is to say that all uses (Edmondson, 2004) of archive contents, whether media or metadata, provided through information services, print media, multimedia, audio or any other production type. The latter definition of access can include all of the

activities associated with dissemination, educational, and cultural or commercial exploitation of an audio archive. All told, access can be understood as the right of all persons to consult and come to share in our sound heritage.

It is important to remember that for many years access to audio documents was dependent on the availability of playback equipment and copies for users to hear in audio booths and other set ups for listening to discs, cassettes and CDs. As spaces for consulting sound documents, the audio library was quite a rare animal.

Incorporation of information and communication technologies in audio libraries

The appearance of the compact disc in 1980 as a sound recording support coincided with UNESCO's recommendation on safeguarding and conserving motion pictures, acknowledging the importance of the cultural and historical heritage of audiovisual documents. At that time, the first reflections on digital preservation of sound documents arose (Wright, 2012).

Brylaswky (2003) asserts that for years sound archivists had been talking about a digital future, but now there is no such talk, because the digital future is here. Between 1989 and 1990, audio archivists accepted that the intention of the classic paradigm of conservation of original material was a futile enterprise because of the instability of the supports and the presumption that required playback equipment would not be available forever. (Schüller, 2008). Moreover, many thinkers in such matters believed that analogue preservation had come to an end or, at the very least, was out of options (Brylaswky, 2003).

All of the audiovisual documents, i.e., video graphics, filmographies, and phonographies, and other audio documents were the first to be transferred from the analogue platform to the digital platform. This was done for the first time in Germany in 1992 at the Arbeitsgemeinschaft der öffentlichrechtlichen Rundfunkanstalten der Bundesrepublik Deutschland, a consortium of public radio broadcasters in Germany (Haefner, 2001). Seven years later, in 1997, the Institute del Audiovisuel dé Francia launched its archive digitization plan (Teruggi, 2004).

The first collections to be digitized were radio programs, because it had become imperative to organize, conserve and archive the massive amount of radio and television material that had accumulated (Teruggi, 2004). At the 2000 Annual International Sound and Audiovisual Archives Association Conference, Albrecht Haefner was one of the first to signal the new theoretical and technological trend that had begun to gain ground in the area of radio and television, i.e., technology for mass storage of digitized contents. (Rodríguez, 2012).

These events notwithstanding, in 1997, five years after the first digitization of materials, experts of the Audio Engineering Society (AES), the National Academy of Recording Arts and Sciences (NARAS) and the Association for Record Sound Collection (ARSC) all agreed that analogue documents should be saved, because the digital formats were in fact unstable (CLIRLC, 2006). This cautionary recommendation came at a time when digital preservation platforms were about to be rolled out.

For more than two decades, the issues surrounding the use of technology to preserve sound documents has driven research and reflection, and has dominated the stage of conferences, forums and seminars of the International Association of Sound and Audiovisual Archives (IASA), the Audio Engineering Society (AES), and other international gatherings of specialists, researchers, archivists, engineers and audiovisual document professionals.

In addition to studies on the reliability of digital preservation platforms, it has been shown that the first digital storage efforts were very expensive, highlighting the need to make digital preservation platforms more broadly available. This concern was address at the 2003 conference on Bridging the Digital Divide by Providing Support to Content Professionals, organized by UNESCO, where the widening audiovisual digital technology gap between first and third world countries was highlighted. (UNESCO, 2003). One year later at the Fifth Program in Technologies for the Information Society, the European Commission created the PRESTO Project for the purpose of finding solutions to the problems of digital preservation. This project focused on new, long-term (20 years or more) opportunities for storage and access (Wright, 2004). The British Broadcasting Corporation (BBC) led the project in partnership with the Institut National del Audiovisuel de France (INA) and Radio, Televisione Italiana (RAI).

In addition to the research developed in the PRESTO Project, one of the most significant contributions to the development of digital preservation technol-

ogy was made by Kevin Bradley, Who published a paper *Toward an open code storage and preservation system: recommendations regarding the implementation of digital audiovisual preservation system and matters of software development,* a proposal for creating open code storage and preservation systems, with the idea making these systems affordable to smaller organizations with urgent sound document preservation imperatives.

The project methodology attempted to describe (something like construct) a small-scale, autonomous, digital mass-storage system using open code software. The system was conceived to assume all of the functions of a standard archive within a digital storage system, such as task management and intake, management and extraction of metadata, and preservation and storage of backups (Bradley, 2007b).

Since Bradley understood that there is no such thing as permanent digital storage, he envisioned a simple, sustainable open code-based system that provides digital preservation management strategy options (Bradley, 2007b). Currently, open code systems are a viable alternative for digital preservation of sound documents.

Digitization and digital preservation

Digitization and digital preservation are closely related concepts. Voutssas Márquez (2009) defines digital preservation as the specific actions and the technologies, whose underlying, long-term purpose is to ensure permanence of and access to the contents of digital documents, regardless of support, format or system. To achieve this, maintenance is required, which is the same as preemptively and permanently protecting and safeguarding such materials. When such materials undergo deterioration or are damaged, we must try to restore them.

In the view of Térmens (2013), digital preservation ensures access to and future use of digital documents created in the present or the past, on the basis of information conservation and security that ensure long-term maintenance and use. Romero (2006) holds that digital preservation is developed as a global task that is ongoing and complex, taking into account physical and logical factors of the information, as well as implementation of proper, adequate and formal descriptions of the documents. Consequently, digital preservation of sound documents is a sustainable method through which sound

documents are conserved, administered and handled, while providing permanent access to the audio digital contents (also called essence or media), their dissemination and reuse, including associated metadata.

On the other hand, digitization is the transfer of the contents held in analogue supports to digital supports, i.e., the process by which the analogue signal is replaced by a digital signal (IASA, 2005). Digitization serves to protect valuable documents from manipulation and deterioration. It is the only way to ensure the survival of audiovisual material (UNESCO-UBS, 2012).

Beyond being an analogue to digital platform transfer and conversion process, digitization is a file management strategy (Green, 2006). Through the digitization process, a certain content is converted; for example, an audio recording is converted into a series of numerical values. According to recommendations of experts and researchers (IASA, 2005; ARSC-Technical Committe, 2011), digitization is based on the following recommendations:

1. Digitization should be performed without compressing data, on the basis of agreed upon digital signal quantification and samples.
2. The analogue signal of the document should be retrieved with high fidelity using proper recording and reproduction equipment.
3. Digitization must be performed without altering the source material.
4. An alpha-numeric coded link between the media and metadata must be provided to identify the material.

Digitization is a measure that serves to preserve documents recorded on analogue supports, and is implemented on the basis of digital preservation. Once the terms digitization and digital preservation have been defined, it is important to keep in mind that there are thousands of documents being produced every day on digital supports. This is why the question of digital preservation is so complex, in that it must deal with both digitized materials and those materials originally recorded using digital technologies. Digital preservation includes intervention and conservation actions. Migration from an obsolete support to new support is another preservation task. Prevention or delay of deterioration or damage are conservation actions that do not prevent obsolescence (Wright, 2012). According to the definition offered by Wright, migration is a part of preservation, and conservation of digital documents is the ongoing work of digital preservation.

The effect of digital preservation of sound files

More than a decade ago, Chen (2001), observed that conservation and preservation would be changed by digital preservation. This change has been so great that it has modified the safeguarding of sound archives through the advent of new professional profiles and flows, the generation of digital copies without losses and the incorporation of media and metadata as basic components of digital preservation. This change also entails the creation of digital mass storage and management systems, and the extension of access, dissemination and reuse of sound documents. Moreover, this change faces a series of challenges derived from digital preservation of sound documents.

New professional flows and profiles

Digitization was the first new process to be incorporated in the tasks of a traditional sound file.

In the view of Westerhof (2011), digitization lies at the root of the organizational changes and generation of problems in files. This process also exerts effects on the way in which we think about archival collections. With digitization, new work flows regarding file identification and intake of digital documents have gradually been incorporated. These works flows also include validation and verification of both cataloging and digitization, and matters involving on-site and remote access, ongoing verification of integrity and consistency of audio signals and metadata, and the periodic production of copies of media and metadata in accord with the policies of the archive. Therefore, employees doing such tasks must have an array of associated professional competencies. When deploying its digitization processes, the National Image and Sound Archive of Holland ran into problems associated with personnel and the changes this brought at diverse levels. The main problem was the change in the work team. Competencies had changed. The approach taken by new personnel jarred with the tools and mindset of the traditional archivists, in a sort of clash of cultures that is not always easy for archivists to understand (Westerhof, 2011).

Archives must face the twin unknowns entailed in digital preservation. On one hand, the continuity of conservation in traditional formats and, on the other, the demands placed on their use (Edmondson 2004). This means that while digital preservation platforms are used, archivists must also continue preforming traditional documental processes, including conservation

of phonograms in vaults. The coexistence of these preservation methods of preservation of analogue and digital collections seems to be the direction of things to come.

Digital copies without losses

We have stated that conserving the contents, rather than the supports, lies at the heart of the change in digital conservation. For many years, production of copies on analogue supports entailed losses of signal fidelity. With the advent of digitization, copies on analogues supports are no longer made. Now the only way there is to have copies and ensure the long-term preservation of archives is to transfer them to a digital platform. The digital document is separated from the support. This separation is the principle of the preservation copy. It is much like an identical clone of the original (Wright, 2012). The concept of lossless copying is only possible within the digital domain (Schüller, 2006, 2012). Consequently, the priority for digital preservation is the conservation of digital contents.

Media and metadata, basic components

As explained before, the two basic components to consider in digital preservation are the digital sound, also called the essence or media, and the metadata. For preservation of sound, it is indispensable to have formats, levels of resolution, supports and technological systems that meet international standards. Version lying outside of such standards are not safe in the long term for migration and exchange of information, or with regard to emerging formats (IASA, 2006).

Metadata constitute the fundamental information for the use and management of sound collections once they have been digitalized. Metadata serve not only to identify and structure information, but also to allow for its retrieval (De Jong, 2001). The metadata of a digital sound file are created on the basis of the information issuing from cataloguing, digitization and management of the sound file (De Jong, 2001). A well planned digital archive will automatically create its metadata and include information regarding the original recording support, the format and state of conservation, the equipment and playback standards, digital resolution, all of the equipment employed, operators and participants and any other process or procedure involved (IASA, 2006).

The metadata of a sound file are key tools for the communication that occurs between current systems and emerging technological systems. Without metadata, the exchange of digital information would be impossible (De Jong, 2001). A sound file needs to document all of the changes undergone by the metadata. The metadata registries, when properly created and maintained, may be made secure against any relevant change or storage applied in the appropriate field (Rodríguez, 2012).

Mass digital management and storage

Over the years and as collections grew, sound and audiovisual archives have faced the main challenge of negotiating for storage space (Wright, 2011). Digital preservation modified the conception of mass storage in vaults before the appearance of the Mass Digital Management and Storage System.

The IASA Technical Committee (2006) defines this system as "An understandable, completely automated and designed for storing, managing, maintaining, distributing and preserving a complex subset of inherited digital objects and their associated metadata, a backup system and simple storage."

The mass digital management and storage system integrate and automate the processes of controlling, digitizing, storing, cataloguing, administering and distributing digital objects and metadata of a sound file for the purpose of ensuring preservation and access. Mass Digital Management and Storage Systems establish the groundwork for operation of a digital file that can adopt open archive models such as Open Archival Information System (OAIS) and metadata management such as PREMIS. Mass Digital Management and Storage Systems are the technological platforms for the digital preservation of a sound file.

Access, dissemination and reuse of a sound file

Access to, and visibility and reuse of a sound file comprise the most relevant changes arising from digital preservation. Thibodeau (2010) has stated that the value of digital preservation exists insofar as the information is used. The final purpose of conservation, therefore, is to optimize the possibilities of use.

Use of the digital sound file is potentiated by the internet and social networks, and new specialized services are created on the basis of sound cata-

logues of a file, which serves to imbue the documents held in each archive with value. Likewise, digital preservation constitutes a fundamental change in the area of promoting a culture of listeners. From this perspective, activities such as the basic selection of an audio library for preschoolers, the creation of a sound map or development of educational or cultural content maps constitute only a few examples of the variety of options that the reuse of sound file presents. A sound file is imbued with vitality and the collected phonographic recordings become a living heritage and fundamental component of contemporary society.

Challenges of digital preservation

Challenges should be understood as the trials that digital preservation of sound files entails in order to guarantee long-term digital preservation. Of these challenges, the following are the most prominent.

Obsolescence and migration

Thibodeau (2010) has established that the only prediction that can be made regarding information technology is that it will constantly change. Consequently, digital preservation conceived as a permanent solution for safeguarding the audio archive, resolving the problems of fragility and obsolescence of recording supports produced more than a century and a half ago, may well be inoperative within a relatively short period of time. As technology matures and density of storage increases, hardware often becomes obsolete; and as computer processors and many software applications fall out of use, users will no longer be able to access many files that depend on these components. Therefore, any decision regarding digital preservation should include technological flexibility. In this regard, Bradley (2007a) has said a long-term, sustainable vision of digital preservation of sound files is necessary.

Consequently, migration is something that will be performed on an ongoing basis. Schüller (2006) and Teruggi (2004) also stress that migration of information to new storage systems as a result of impending obsolescence of the earlier storage system is a key part of digital preservation. According to Schüller migration is a cyclical process that should not be delayed beyond a ten-year horizon.

Technological breakdowns and human errors

Digital preservation is fragile because of the inherent risks of using technology and human error. Van Malssen (2011) has stated that some of the common risks to digital media, which can be applied to digital preservation of sound files, involve operational errors in the use of software and hardware, file transfer glitches, and internal and external attacks.

Moreover, human errors in the operation of mass digital management and storage system arise from lack of specialized qualification and training in the associated technology (Van Malssen, 2011). Since preservation is a new area of knowledge, many institutions do not have the qualified personnel to handle the technology. Sometimes, technical personnel is hired, who do not have the requisite knowledge, leading to human errors affecting the operation of the digital archive. What is more, the capacity to respond to internal and external attacks is related directly with the ability to have professionally qualified personnel on staff.

Social, economic and political continuity

Social, economic and political continuity is perhaps the greatest threat. If the institution decides not to support the maintenance of digital preservation, digital resources may well disappear. In this regard, the Vancouver Declaration, (UNESCO-UBC, 2012:1) states that "large amounts of information are continuously lost because its importance is unknown, the lack of legal and institutional frameworks for ensuring its conservation and better training and funding are needed."

In this sense, Wright (2012:15) states:

> In the physical (analogue) world, the environment of storage spaces, including such things as temperature and humidity control and fire prevention systems, are fundamental. In the world of digital preservation, the topics to consider are the social, political and economic contexts, and the management of an unseen archive.

The continuity in digital preservation of an audio archive is associated with long-term sustainability

Natural disasters

Natural disasters such as floods, earthquakes and fires pose risks to both analogue and digital archives. In order to safeguard such archives, institutions will have a least two copies held in alternate sites in conjunction with a disaster recovery plan (Van Malssen, 2011; UNESCO-UBC, 2012).

Lack of metadata

The lack of metadata represents a threat in the management in large collections of digital documents (Van Malssen, 2011). In analogue archives, the lack of identifying metadata is serious, but in digital archives it is even more damaging, because the support is not available. Before beginning the digitization of sound collections, an inventory of the collection including the basic metadata for identifying the digital document is a prerequisite

Conclusions

Over a century and a half ago it became possible to record sound to a support medium. After this achievement, millions of sound documents reflecting the history of artistic, cultural, scientific and political heritage of humanity have been created. As such, the preservation of analogue collections was a major task of archives, libraries, audio libraries and other depositories of sound memory.

The root of a fundamental change in audio archives began by acknowledging that conservation of original material was a vain effort because of the instability of supports, and the problem of the availability of playback equipment in the future.

With the advent of digital preservation, the priority was to preserve the content rather than the support. Consequently, the sound archives undergo a transformation that can be observed through the incorporation of new work flows and professional profiles defined by the coexistence of both analogue and digital preservation methods, the production of lossless digital copies (which has changed the notion of the original), the incorporation of media and metadata as basic components of the digital files, the use of Mass Digital Storage and Management Systems, as well as an expanded capacity for access, dissemination and reuse of the sound document.

Digital preservation of produces a change in the audio archive that entails a series of challenges, including technological obsolescence, ongoing migration, technological breakdowns, human error, and social, economic and political continuity, natural disasters and lack of metadata.

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