Technical Committee on Archiving, Restoration and Digital Libraries
Report on Emerging Trends
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Co-Chairs: David Ackerman and Chris Lacinak

I. Introduction

The subject of archiving, restoration and digital libraries is expansive and far reaching into many areas of expertise of the AES. The actual predominant theme represented by the participants of the TC ARDL is best described by the general term of "preservation". The following text sets forth the recurring topics and issues expressed at the TC ARDL meetings.

The subject of emerging trends has been approached first by offering a section on the perspective of long standing, and still present issues in the field. This section is followed by emerging solutions for addressing the overarching issues. For those looking for quick general trends in the field, a practical observations section follows the solutions section. After the practical observations we have listed significant current projects that embody aspects of the proposed solutions.

II. Primary Issues

a. Obsolescence of technology and expertise

We constantly face obsolescence of the technologies and expertise that support our objects of preservation. Obsolescence is a fundamental concern of preservation and access to content and a primary issue informing preservation strategies. With the fading away of equipment and expertise into obsolescence we lose the nuances associated with intimate knowledge of a technology. With the loss of nuance comes the lack of assurance that we are able to attain a faithful reproduction of the original recording. Because obsolescence is not a black and white issue archivists are not always clear on the risk factor to assign a format. This lack of clarity on such a significant issue can have dire consequences. We must as a community come up with ways to combat obsolescence.

b. Lack of adequate resources and tools

The community is generally either lacking, or crudely adopting tools that exist for other fields to use for preservation purposes. We need resources and tools for lab work; we need resources for training and education; we need tools for management of metadata; we need tools for assessment and prioritization. Professional tools that exist for broadcast are largely misrepresentative of our needs in the preservation community. They deal with consistent quality content

and use broadcast specifications as parameters and quality control points. This is not appropriate or sufficient for the preservation community. We need the creation of preservation focused resources and tools across the board. We need tools and resources that increase knowledge, efficiency and focus the need for expertise wherever possible.

c. Reactive to proactive

The lack of resources combined with the sheer quantities that we face has effectively placed our community in crisis management mode at all times. This has meant that we either take action only when the situation is dire enough to make itself evident, or we fail to take action at all. The inability to be proactive in our efforts and gain adequate physical control over our collections has in many cases left the decision on preservation of content to fate instead of with curatorial, library or archive staff.

d. Need for increased education

With the obsolescence of all things legacy, including documentation and expertise, it is of paramount importance that good information be documented and disseminated. This is not only relevant for academic institutions, but also for all institutions charged with the mission of sound preservation. Access to equipment and experts to maintain and repair equipment is increasingly limited. Education and dissemination of information supported with well documented and well structured resources is an imperative part of the overarching preservation strategy for our collective holdings. We need to put forth the effort and resources now to attain and form this body of work before it is too late.

The orientation of such resources should follow two different perspectives.

> 1. The technician that aims to perform preservation work and needs to be made aware of the implications of their actions on the goal of preservation.

> 2. The archivist that oversees a collection and needs to become more familiar with the system that houses the object of preservation in order to be responsible and well informed in their duties which include overseeing preservation activities.

e. Broad fields of expertise required

The act of sound preservation involves a broad range of knowledge and practice from numerous and diverse fields. These include library science, engineering,

computer science, audiovisual production, material sciences and chemistry. Therefore people from many backgrounds embrace, and are embraced by the field of sound preservation. This dependence on such a diverse skill set has been both a help and a hindrance. A positive aspect of this is that it makes the field such an interesting one to participate in, and makes for a dynamic community. The hindrance is that the allocation of need has been disproportionate to the allocation of available expertise. It is only recently that this gap has narrowed and the field is beginning to learn to integrate new fields of expertise into its progression.

f.   Protection of technical dependencies and proprietary information

Valuable information necessary for unlocking many of the barriers to preservation has, and is fading away. This consists of both the chemical and physical make-up of media, as well as proprietary software and hardware coding. Both of which are invaluable to archivists in the management and preservation of collections. The loss of information has taken place through the discontinuation of proprietary products and the loss of companies that created them. Along with their loss goes the proprietary information that our community requires. Efforts at retrieving information and reverse engineering technologies have exhausted a lot of the community's limited resources. In many cases the barrier created by the loss of this information has halted preservation efforts altogether.

g. Lack of standards

The current lack of standards for preservation affects our community in many ways and to a great extent. There are almost no preservation oriented standards. A client that sends a collection of media to a vendor to perform reformatting has only input format, output format and bottom line cost to use as points of definition and reference. There is no consensus from lab to lab on "standard practice". Each lab uses different methods, tools and practices. This causes many problems. One is that it generally makes price point the only deciding factor. With a lack of standards this generally means a difference in approach. Standards that focus on preservation need to be developed so that the community has a common point of reference and conformance and is assured of "preservation" quality work.

Standards also aid consistency – one of the fundamental premises of preservation. Without standards, consistency is practically unattainable. Standards promote multiple aspects of the preservation focus including transparency, adoption by the marketplace/field, integrity and stability.

h. Copyright issues

While copyright issues are not a matter addressed directly by the TCARDL it would be remiss to not recognize them as a major and present barrier to preservation. Lack of clarity and/or flexibility of laws to support both economic and preservation interests have caused a state of paralysis. Few organizations are willing, or able to fund preservation efforts that have an unknown or negative return on investment. While laws stand still our media continues to deteriorate, eventually rendering the content inaccessible, and of no value. This would certainly be a failure to historic, cultural and economic interests.

i. The role of structural metadata

We are witnessing a period of great change in the way we think about audio preservation. As a result, the collective communities concerned with the task of preserving recorded sound are struggling to understand the differences between the old analog approach to audio preservation and what new requirements will be needed to carry out long-term audio preservation in the digital domain. While we are still in the digital preservation "dark ages", the value of maintaining structural metadata from the very beginning, and throughout the audio preservation process is understood as significant. It is certainly clear that long-term preservation can not be achieved without proper and adequate metadata. The extent of metadata required and the methods of capture and management, for many, are still unclear.

j. Lack of funding

Outside of broadcasters and other companies with an obvious and immediate business case, the main preservation issue is funding. Much of the worlds culturally and historically significant collections are bound by the need for more funding for the development of tools and resources. Historically funding has gone towards preservation of specific collections as opposed to the development of an overarching infrastructure, resources and tools. We have seen this shift to some extent. Projects such as NDIIPP have worked toward developing infrastructure. Projects have been taken on by the Image Permanence Institute and within the PRESTO initiative that seek tools for assessing media degradation.

In looking at non-commercial archives through the lens of business sense, our perspective is succinctly positioned using the old proverb "Give a man a fish and he eats for a day. Teach a man to fish and he eats for a lifetime". There has been very little teaching. The funding of community based infrastructure and educational programs have a return on investment in orders of magnitude greater than funding isolated projects to preserve specific collections. In order to do this there is a need for both increased funding and a broader allocation beyond what currently exists.

This distinction between funding technologies and tools vs. projects is an important one. Traditionally it appears as if the community assumes that development of tools and technologies may come from commercial interests. However, sound preservation will not gain commercial interest without standardization and validation as a field. Without standards it becomes difficult to both define and validate the existence and size of the community being served. The field is seen as "niche" and scattered. Without the ability to quantify the community there is a lack of interest in commercially funded ventures. Without funding from private commercial ventures to support advancement the community is only left to grant funding to come up with these resources and technologies. This funding alone is not adequate even with the return on investment. Standardization and positioning of the field as a valid professional field are important factors in bringing about funding for further progression of the field. Standards and tools need to be created that are flexible enough to serve both commercial and non-commercial interests. The union of interests creates a larger community, enabling vendors to respond more effectively.

III. <u>Paths of Progress</u>

a. Research and development

For too long the audio preservation community has been limping along adopting and "rigging" solutions to fit our needs. The audiovisual preservation community has been grass roots in nature forging ahead with great passion. This is admirable and has served the community to a great extent. It is time though that we elevate the field to the professional field that it has evolved into. We need real funding, real tools and real resources to perform the work we are charged with performing.

We need development of diagnostic tools for increasing accuracy and enabling better assessment and prioritization as well as tools and resources for increasing efficiency. Current assessment and prioritization efforts are for the most part general and reactive. Efforts at developing a quick and accurate tool for detecting degradation of media have yet to yield meaningful results. This is an area of major need. Without this we can not truly manage our collections. We also need tools for increasing efficiency. These would consist of tools for identification and preparation of media, quality control, metadata management and reformatting.

We also need to see preservation oriented standards emerging from standards forming bodies. Consistency is both a friend of preservation and commercial interest. Standardizing takes what is usually considered "too niche" of a market and fills out the user base to a number that is more attractive to prospective business ventures interested in serving the preservation community. Standards

also help to validate the field as a professional field that deserves the attention of the market place and of other fields.

We should be collaborating with and bringing in other fields of expertise including physics, chemistry and material sciences and looking at prospects for technology-transfer. Our needs are broad. To be insular is to ignore the true needs of our archives.

Technology development, standards creation and collaboration and technology transfer from other fields will bring great growth to the field. This is only part of the equation.

b. Education

Education is just as significant of an issue as technology and R&D. While high efficiency reformatting and new technologies are required to overcome the challenges we face we must be aware of their implications. Both of these advances, in an effort to reduce the need for expertise and increase efficiency create a further distance from expertise regarding the technologies which they address. When tools are created that reduce the need for expertise, people who have performed these tasks in the past fall out of practice. Their expertise is ushered into obsolescence. Without thorough documentation and dissemination of information on the expertise involved we stand the risk of growing further separated from the fundamental practices and technologies required to reproduce our content. Education serves as a counter to obsolescence of expertise.

Initiatives within AES committees and workshops offer a helping hand by providing relevant information to those concerned with preservation, but these alone are not enough. We need education in audio/video engineering programs, on-site training and regional workshops. We need curriculums and texts that can be common to all of these efforts and serve as a community wide reference. Similar to the way that one can attend multiple Physics 101 classes and see the same well structured, well documented examples and references.

In the past there has been a large gap between theory and practice in the field of audiovisual preservation. There has been both a certainty that audiovisual archivists should have hands on interaction with their audiovisual media and a looming unknowing as to what degree was appropriate for an archivist. A primary charge of audiovisual preservation training should be to fill this gap and help offer a toolset to the archivist who was previously without adequate tools. Enabling this knowledge democratizes the process of audiovisual preservation and also gives monetary relief by offloading appropriate tasks from an engineer or technician to the archivist. As well, the whole is greater than the sum of the parts. The ability of the archivist to adequately assess their collection brings about greater capability for fund raising, more meaningful vendor pricing and communication, greater

quality control tools and can even greatly aid processes such as high efficiency reformatting.

c. Resource sharing

As previously pointed out, significant funding needs to be allocated toward infrastructure and tool development. The return on investment and cost/benefit is ultimately more beneficial than addressing only preservation of specific collections. There is perhaps a short term sacrifice for a long term gain.

Primary focuses should include community based infrastructure development revolving around joint needs of organizations in the same general location; creation of a national equipment registry to identify the national equipment holdings, particularly equipment that is obsolete, and a large union catalog, ensuring that efforts are not duplicated.

d. Continuing emergence of open and protected disclosure of standards and technology

There has been an emerging recognition in the audio industry mainstream toward the significance of preservation. Value of archived audiovisual assets, as well as the extensive effort and cost in preserving content stored on legacy content has been realized. In an effort to act on lessons learned from this experience corporate and broadcast clients have demanded greater support for preservation in the production of new content. Vendors of audiovisual products have responded with better tools for enabling greater capability for preservation. Individual vendors have begun integrating archives into the center of their workflows and mind state. This is a new trend emerging over the past 5 years. MXF is an example of a consortium driven effort revolving around more openness, as well as increased support for interchange and preservation. Efforts such as these are seen as a positive emerging trend. Further progress is envisioned as representation of a broader user base including Universities and smaller archives. Adoption of the metadata standards emerging from AES SC-0306 by manufacturers and vendors in the audio industry is seen as another important step forward to exhibit the dedication and interest in further supporting preservation.

Other emerging trends as well as continuing needs is to develop and use preservation standards, open source software and for-profit companies to place their documentation in escrow. These are all imperative in ensuring that assets of archives remain accessible, and therefore valuable.

e. Support for metadata

As mentioned in the "primary issues" section of this document, the extent and methods of capture and management of metadata still remain unclear. Although there is a lack of total clarity around these matters, there has been much progress made in recent years.

AES SC-03-06 is in the process of producing two different metadata standards in support of audio preservation. These are standards that document audio objects as well as transformations and events that occur to audio objects throughout their life. These standards primarily address administrative and structural metadata.

Addressing the need for additional structural metadata, there are several existing standards that may be used in the context of an audio preservation package. The Metadata Encoding and Transmission Standard (METS) provides some structural metadata in a generic way. There is also Synchronized Multimedia Integration Language (SMIL), and the AES-31-3 Standard which is designed for simple project interchange between professional Digital Audio Workstations. Depending on the needs of an organization, any of these may be useful for providing structural metadata that describes the time-line relationship of one or more audio files to each other and to the original source material. As useful as this structural metadata is for interchange, it is increasingly clear that this metadata also serves an important role in the long-term preservation and access of audio holdings. In addition to using a document derived from one of these standards as a play-list, which is certainly possible, one could also use its file inventory to drive a just in time sample-rate conversion or even a format migration. This would enable the archival material to be accessed from delivery systems that present a range of differing constraints on their input.

IV. Practical Observations

- Broadcast Wave File Format has become the de facto standard for preservation of audio content within field

- A resolution of 24 bit/96 kHz has become the de facto standard for preservation of audio content within the field

- There is a great need for continuing development of metadata standards and tools. Metadata has been given much more attention with the rise of Digital Repositories. AES has responded with emerging standards for Audio Objects and Process History through SC-03-06 addressing administrative and structural metadata standardization.

- Sound for moving image is a bit in limbo, currently being grouped with moving image preservation for the most part. Preservation of sound for moving image is a current focus for future attention of the TCARDL.

- Moving image and sound preservation graduate programs are emerging throughout the world to support those who oversee and manage moving image and sound archives. This is acknowledgement of the differing skill set from traditional paper and still image archivists.

- Manufacturers have begun to enable preservation activities through additional metadata capabilities and support for open formats.

- IT and programming skills are an ever-growing need in the fulfillment of preservation. This is an emerging required understanding/skill for audio engineers.

- Requirements and specifications for digital repositories serving preservation and access roles are in the midst of development.

V. Current Significant Projects and Initiatives

a. AES SC-03-06
http://www.aes.org/standards/b_policies/group-scopes.cfm#SC-03

As previously mentioned, this group is currently involved in the creation of two different metadata standards. It should be noted that the chairs of the TC ARDL are also members of SC-03-06 and are primary contributors in developing these metadata standards.

The scope of the SC-03-06 Working Group on Digital Library and Archive Systems addresses, within the scope of SC-03, the application of digital technologies for media preservation and access. Among the topics covered are strategies for content conversion and migration, content integrity, methods of access and distribution, storage systems and media, formats for preservation and distribution, and metadata and documentation. The working group will take account of the work of other organizations in this and related fields, and will liaise and work in conjunction with them.

b. Sound Directions
http://www.dlib.indiana.edu/projects/sounddirections/

The Indiana University Archives of Traditional Music (ATM) and the Archive of World Music (AWM) at Harvard University have received a grant from the National Endowment for the Humanities to undertake a joint technical archiving project-a collaborative research and development initiative with tangible end

results-that will create best practices and test emerging standards for digital preservation of archival audio.

c. National Recording Preservation Board (NRPB)

http://www.loc.gov/rr/record/nrpb/

The National Recording Preservation Board, mandated by the National Recording Preservation Act of 2000, is an advisory group bringing together a number of professional organizations and expert individuals concerned with the preservation of recorded sound.

d. The National Digital Information Infrastructure and Preservation Program (NDIIPP)

http://www.digitalpreservation.gov/index.html

Has the mission to develop a national strategy to collect, archive and preserve the burgeoning amounts of digital content, especially materials that are created only in digital formats, for current and future generations.

e. PRESTO SPACE

http://www.prestospace.org/

In order to enable any European archive owner, from small collections to the largest, to manage an autonomous and realistic patrimonial policy, including preservation and exploitation of digital assets, PrestoSpace will push the limits of the current technology beyond the State of the Art, bringing together industry, research institutes and stakeholders at European level to provide products and services for bringing effective automated preservation and access to Europe's diverse audiovisual collections.