Broadcast Archives: Preserving the Future

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ABSTRACT
A survey has been made of the holdings and preservation requirements of ten major European public service broadcast archives. The survey also covered 'the business they do and how they do it': the contribution made by the archives to the business of broadcasting. The archives gave their plans for future services as media moves from 'tapes on shelves' to mass storage and electronic distribution. This paper links the urgent requirements for preservation to a strategy for building the digital archives needed for the future.

KEYWORDS: multimedia, archive, preservation, digitization, digital library, funding, preservation technology

INTRODUCTION
The Problem: Millions of hours of valuable multimedia content - and irreplaceable European heritage - is at risk because of ageing media and technology. The content of European public service broadcast archives is the social and cultural history of the 20th century, on a European scale. Largely paid for by the citizens, it should be preserved for their benefit.

Broadcasting is a twentieth century industry, and television a post-war industry. Videotape came into general use thirty to thirty-five years ago. Ageing of audio recordings, film and videotape, plus obsolescence of videotape equipment, combine to produce a problem not previously encountered in broadcasting: all broadcast archive material from the beginning of broadcasting to roughly the end of the 1980's is now at risk. The "preservation requirement" is approaching broadcasting like a tidal wave, bigger and more potentially destructive each year.

An estimate ten million hours of material of national and European significance are at risk. The cost of preserving such material is between 100 Euro per hour for audio and videotapes and 2000 Euro per hour for film. The total cost of preserving this material using present methods and technology is well over one billion Euros. Unless new, more cost-effective preservation methods and technology can be found, the preservation price may simply be too high and significant portions of the audiovisual memory of the last half century will disappear.

PROJECT PRESTO
Broadcast archives and technologists have joined forces to better understand the issues and problems, and develop solutions and joint standards. This joint effort has been made possible by funding from the European Commission Fifth Framework Programme in Information Society Technologies: Cultural Heritage Applications. PRESTO is a 21-month, 4.8 M € project

to develop broadcast archive preservation technology.

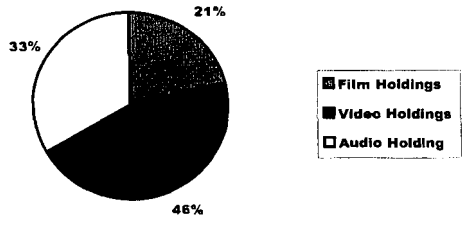
But - preservation is also transformation: to digital media of some sort, opening new possibilities for storage and access. Therefore this project has also considered future methods of archive usage (and revenue generation) in order to achieve the true 'best cost' when considering the possibilities, over the next 20 years or more, for usage of the preserved content.

Principal partners:
The project is led by the BBC (British Broadcasting Corporation), and full partners are two of the other largest European national archives: INA = Institut National de l'Audiovisuel and RAI = Radiotelevisione Italiana.

Technical partners:
The technical partners are all specialists in various aspects of media preservation, digital media and multimedia technology: Advanced Computer Systems, Italy; e-vod, France; ITC/IRST, Italy; JOANNEUM RESEARCH, Austria; NTEC, Germany; Snell & Wilcox, UK; Vectracom, France.

User Group:
In addition to BBC, INA and RAI, seven more national European broadcast archives are included as a user group, providing full data about their contents and operations, and evaluating the progress and outcome of the project. These partners are NAA, the Netherlands; NRK, Norway; ORF, Austria; TRT, Turkey; SVT, Sweden; SWR, Germany; YLE, Finland.

FINDINGS OF THE ARCHIVE SURVEY
A survey was made of the holdings and preservation status of ten major broadcast archives. These archives represent a significant portion of total European broadcast archives, including some of the largest individual collections.



Holdings:
The survey found about 1 million hours of film, 1.6 million hours of video recordings, and 2 million hours of audio recordings in the ten archives. **Total European holdings of broadcast material are probably ten times larger**:

- **10 million hours of film**
- **20 million hours of video**
- **20 million hours of audio**

Access:
The content is unavailable to the general public and often unavailable even to national archives and educational institutions. Much of the content is unique, master material that cannot be allowed to circulate generally, and all of the content has rights issues. **A major goal of preservation work for broadcast archives must be to find joint solutions to preservation and access problems: preservation for access.**

Preservation Status:

- **Obsolescence:** At least 2/3 of the material in archives cannot easily be used in its existing form
- **Deterioration:** Approximately 1/3 of the material has one form or another of deterioration
- **Fragile media:** Roughly ¼ of the material cannot be released for access because the media are too easily damaged

Cost per use:

True cost of an asset is total lifecycle cost. True benefit is related to the number of times that asset is used over the lifecycle. Archive preservation strategy should aim at the "lowest cost per use" over the life cycle of the new media, NOT at the lowest transfer cost.

Bulk Preservation:

It costs money to select material, and to develop statistics for archive usage. The value of archive material very high – up to 100 times the cost of preservation. **In general, it makes economic sense to preserve the bulk of current content, rather than taking a piecemeal approach.** As a rough rule-of-thumb, the high value of material when actually used means that **one minute of sold or re-used archive material will pay for one hour of preservation.**

Security Copy:

Much of the material in broadcast archives is unique, and exists on ONLY a single master carrier. One of the major benefits of moving to digital technology, especially datatape, is the decrease in cost for backup master copies once media leaves the analogue domain (this is especially true for film). The costs and benefits of datatape masters, over at least a 20-year item lifetime, need to be assessed within an overall context of moving from media-based to mass-storage based processes during that time period.

Actual Costs:

Information from all ten archives gave the following overall media transfer costs per hour of media, in Euros.

	Like-for-like preservation cost/hr	Usage over life-cycle of material	Cost per use
Film	2000	5	400
Video	200	5	40
Audio	120	5	24
	Mass storage preservation cost/hr	Usage over life-cycle of material	Cost per use
Film	3000	10	300
Video	300	10	30
Audio	180	10	18

These costs, for the year 2000 in Euros, exclude much significant detail, and do not represent the actual costs for any particular archive or project

Digitisation and mass storage is about 50% more expensive, but is expected to double the usage of an asset.

Funding:

The aim of preservation work is to retain for the future, as cost effectively as possible, that portion of existing broadcast archives that will contribute most to future usage. The conclusion from current overall archive usage figures is that **the value of an item must be more than four times the preservation cost** in order to be financially justified on a commercial basis.

areas to optimise equipment and streamline movement of material,

- **investment in in-house rather than contracted facilities.**

- **Links to the wider business process:**
  - **programme documentation,**
  - **subtitle information,**
  - **rights clearance,**
  - **creation of new metadata to improve the catalogue**
  - **extraction of key frames**
  - **automatic speech recognition.**

These issues are not considered part of preservation work, but need examining at the end-to-end perspective of the entire business. At the business level, it may become cost effective to include work within a preservation project which pays off to another part ot the business. An example would be digitisation of programme documentation (scripts, running orders, contracts) as part of preservation work, in order to increase usability of the new media, and decrease costs of activities such as rights clearance.

Link to future business – **the most important single issue which does not fit into a like-for-like, item-based piecemeal approach to preservation is using preservation work to create the future archive.** An archive needs to move into the technology that will be needed in the next decade, rather than simply producing the particular tape format needed in the current year. It is hard to do strict cost-benefit evaluations of future requirements, and hence hard to develop a business case for justifying transforming archive technology.

The decision making requires managerial vision, a commitment to the eventual development of "tapeless working" in TV and Radio. At the minimum level, this vision consists of accepting that electronic access would double the use of archive content. At a wider level, the vision may involve a broadcaster abandoning the perspective of lowest cost, greatest return on investment, and accept that with the demise of ¼" tape in Radio, and the certain growth in server-based operations in TV, a broadcaster could be motivated to conversion of the archive on grounds of "necessary technology" rather than "lowest cost". **It is vital to the future of broadcasting and broadcast archives to have an increased appreciation of the value, not just the cost, of new technology.**

Key-link Technology

While the overall process is the most significant factor in the cost effectiveness – and future success – of preservation work, there are significant individual 'key links' in the process chain that are at present labour intensive or otherwise ineffective. PRESTO has identified the following Key Links, and is developing innovative replacement technolology

Videotape Transport / Playback - It is particularly important to have the best possible electronic processing, to ensure reliable and stable signal detection, to the greatest degree possible using modern methods. This will minimise the dropout, and hence minimise the transfer errors. This approach is better than relying entirely upon dropout correction, which is not perfect and is

essentially a restoration technique, not a preservation technique.

It is also possible to improve the mechanics of old transport, and improved handling is being developed for 1" and U-Matic machines, particularly addressing the problem of tape motion impairment (sticktion). Dropout correction will be re-examined with regard to digitisation, because if a video signal is being captured to a server there are opportunities for signal correction which are not possible in a standard transfer (eg using information from adjacent frames and from preceding as well as following lines)

Film Transport – A major problem in broadcast archives is news item films from the 60's and 70's, often spliced item-by-item onto 'day reels'. This material often falls apart when running through film transport, and manual cleaning and resplicing is 90% of the preservation cost of this material. A fully-automated method is being developed for this material. Alternative methods of film handling which do not require re-splicing is also being investigated.

Quality Control – This remains the main transfer cost, but with modern transfer operations requiring four or even five items being transferred simultaneously, full manual monitoring is not performed. Automatic methods to identify basic problems with audio signals will be developed, as a 'software toolkit', to back up the spot checks performed by the operator. This will allow the operator to concentrate on properly setting up a transfer, ensuring initial quality, and then relying upon automation to warn of signal dropout or gross problems during the course of the transfer.

Signal Capture – while video is easier than audio in terms of multi-signal monitoring, it has far more problems with signal dropout or transport errors (head clogging) during playback. The gross errors will appear on the monitors, and the trivial errors (single-line dropout) can be immediately compensated in hardware. In between these extremes, the operator will not know how much brief loss of signal has occurred. Improved monitoring of playback, with automatic logging, will be developed.

Error Logging – many aspects of signal playback my have problems. Signal restoration projects have identified dozens of artefacts in archive signal: blotches, scratches, flicker, grain, noise, fading. Many of these artefacts can be automatically detected, with varying degrees of difficulty and success. Although preservation work is not the same as restoration, it is desirable when doing preservation work to capture any useful information that may be needed for subsequent handling of the item. In audio, such a log is now an addition to the EBU Broadcast Wave Format [1] standard.

Other key links for audio and video are:

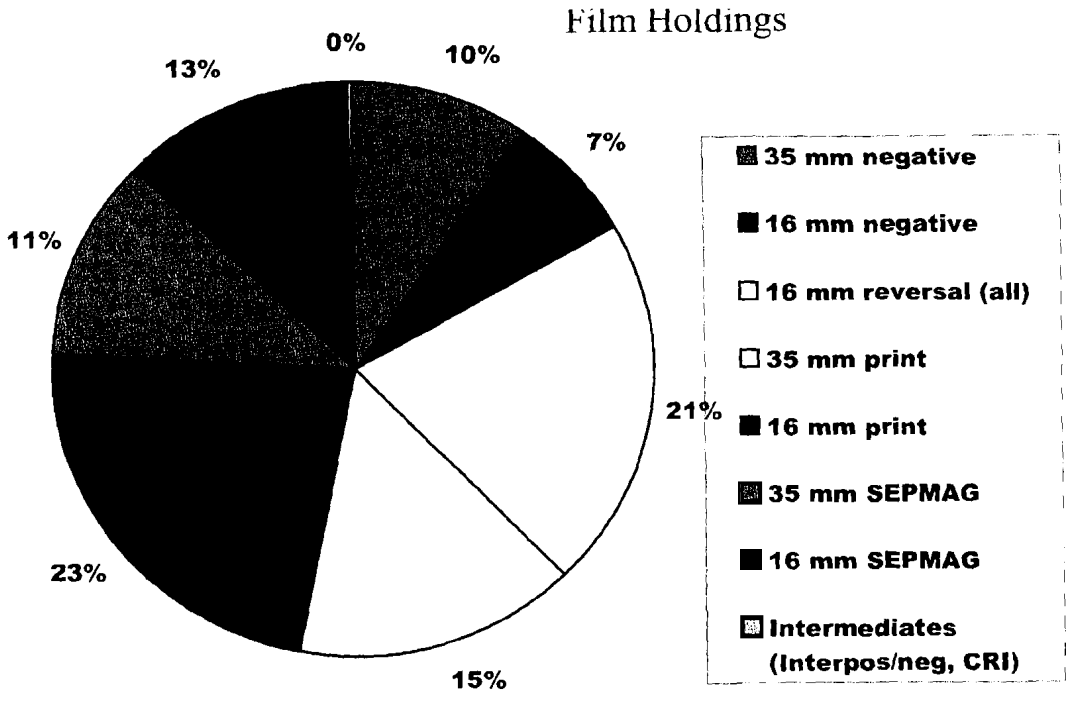
- **Lossless encoding (audio and film/video)**
- **Multi-level encoding for film** (creation of a master format which efficiently supports conversion into all required presentation formats for both cinema and TV)
- **Multi-level encoding for video** (efficient creation of various quality levels: keyframe, internet, browse, studio)

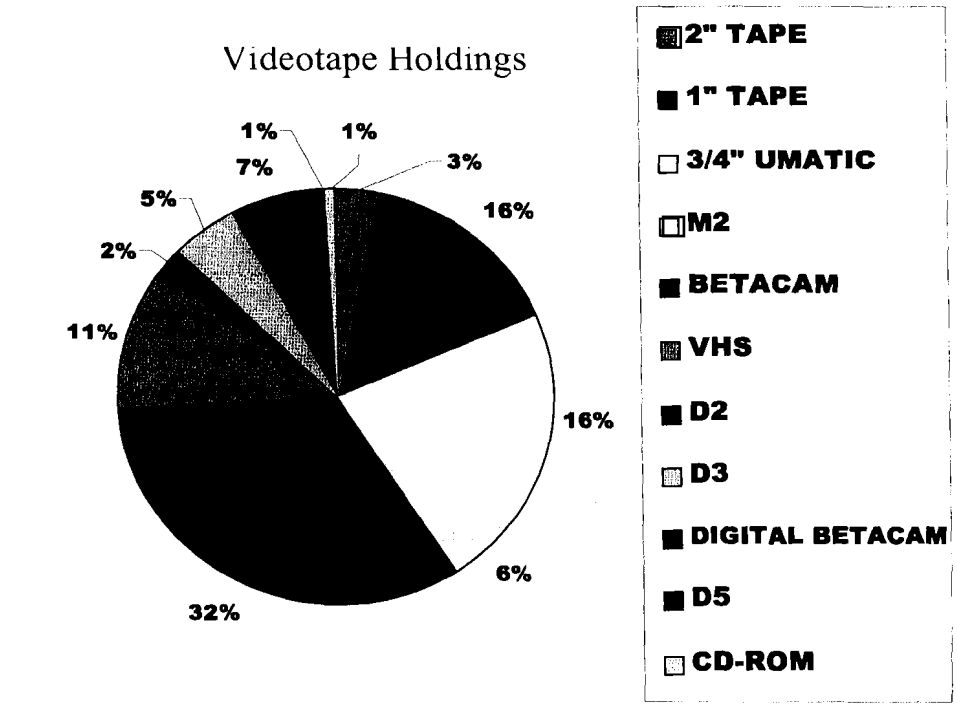
Efficient **metadata management** will be developed for handling multiple versions of the same underlying

material (essence). Practical aspects will be incorporated in the encoding 'key links':

- ensuring exact time registration
- metadata maintenance across all versions
- time code
- other embedded metadata
- links to external metadata (catalogue)

Standard Metadata – The final aspect of metadata management developed by PRESTO will be a demonstration of the methodology for using a preservation process to standardize metadata. Data from multiple broadcast partners will be converted (mapped or restructured, as required) to form a common catalogue.

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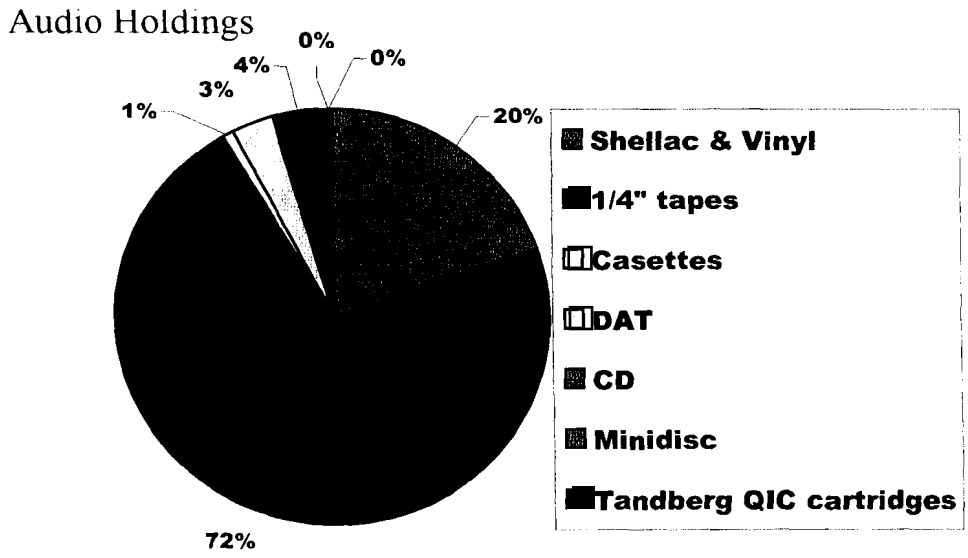
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PRESTO WEBSITE

More information and full deliverables covering all the above – and more – is on the website:
http://presto.joanneum.ac.at

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1. EBU document T-3285, July 1997: **Specification of the Broadcast Wave Format.**

http://www.ebu.ch/pmc_bwf_ug.html

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