Technical Report 006

EBU

Archives Report 2010

EBU **TECHNICAL**

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Executive Summary

Television archives are moving from videotapes to files. They are becoming an integrated part of the production process offering improved concurrent access, more material reuse and smarter searching. Physical media handling is replaced with content management. Journalists have more 'self-service' archive access, while archivists become metadata controllers and advisors.

Broadcasters face several challenges in implementing such archives. The first relates to general project management. Staff and departments can be reluctant to change their roles and workflows. A lack of information on the current working practices and missing agreement on the future tasks early on in the project can cause failure at a later stage. Most broadcasters reported their projects to have achieved the desired results, but over 40% were not in time and about 25% were not in budget. Reasons include inadequate change management, a lack of allocated resources (both at the broadcaster and the vendor side) and a mismatch of vendors' understanding of broadcasters' needs.

The second challenge is technical. The main problem reported by experienced broadcasters is the lack of interoperability between vendors. File incompatibilities lead to the need for transcoding. This consumes storage bandwidth and processing power. Other problems are caused by inadequate networks (typically due to bad design) and time-consuming legacy system integration. Broadcasters who have not yet implemented an integrated archive have higher expectations of the level of integration than broadcasters who already have an integrated file-based facility. Vendors seem the most cautious. A phased approach with focus on individual domains is recommended.

HDTV primarily brings higher quality for current and future use. There are costs in terms of storage and bandwidth due to increased file-sizes, although this is not true for all formats. The plurality of formats brings transcoding costs (higher costs than with SD - due to higher processing demands), an investment risk and additional integration costs. HD products may be 2-3 years behind SD products, which means HD workflows cannot necessarily replace SD workflows 1:1.

Key questions to address are:

1. Should I outsource archive services?
Around one third of the respondents use (or intend to use) contracted services for long-term storage and preservation of their content, aiming to have a more future-proof/cost-efficient solution.

2. Should I use one file format?
Broadcasters and vendors differ in opinion. Storage costs, transcoding costs (equipment, time and quality), complexity, and equipment and workflow constraints all play a role.

3. Will my retention strategy change?
Broadcasters report long-term value and usage figures are still the main selection parameters, but more rushes are archived. Web content archiving has no best practices yet.

Broadcasters expect the EBU to publish recommendations on standards and user requirements, their lifecycle and real-world impact. Also sharing of Members' experiences is regarded important. The EBU will consider follow-up work on archives in its Expert Community on Integrated Production.

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Summary

The EBU P/DATA Group surveyed broadcasters, archives and vendors to identify the most important challenges and experiences when **fully integrating a file-based archive in television production.** This summary provides a condensed overview of the current status and shares some conclusions and advice reported from the field. It is aimed at readers looking for the key-points in this document.

Organisational

Benefits

The integrated archive has a central role in the organisation. The archive is a production and preservation tool. Its workflow is distributed throughout the operation. Vendors tend to stress concurrent access, reduced costs and automatic ingest/annotation as its main benefits. Experienced broadcasters rank concurrent access, more material reuse and smarter searching as the top-3.

From media to content management

File-based archives mean a shift from physical media handling to content management with emphasis on metadata. The main workflow change is more 'self-service' for journalists/producers in terms of selecting and using material from the archive. More responsibility on the (mis)use of material is put on the user (journalist). The archivist is becoming a 'Metadata Controller' which verifies the metadata, provides better search options and gives training/advice. Archivists may also be able to expand their acquired journalistic perspective on material selection to the legal dimension of license- and copyrights, and maybe marketing and footage sales.

Reluctance and resistance

Broadcasters report organisational change problems, especially:

- Staff which is reluctant to change the current workflow.
- Changes in competencies, which create resistance.
- A lack of interdepartmental cooperation.

Retention strategy

The retention strategy in file-based archives does not change fundamentally. The two main selection criteria are still the content's long-term value and usage figures. But file-based archives do allow to store project files (e.g. how a programme was edited exactly), which may create versioning challenges. Further the ease of archiving can increase the amount of rushes stored. A working policy is needed, also to ensure good metadata is supplied with material-to-be-archived. Consider specifying a 'time-out' period: "if no metadata is provided within 3 months, the material is deleted".

Web content

Most broadcasters do not archive web content. As there currently are no best practices in this area, two main questions need further evaluation: what web content to archive and in what form?

Usage Rights Management

An integrated digital archive is as efficient as its weakest link. Unambiguous and easy to find

(license) rights information is the key for efficient content usage.

Technical

Interoperability

Archive integration typically starts with the newsroom system, content ingest and the play-out system. The main problem reported by experienced broadcasters is the lack of interoperability between vendors. Similarly from the vendors' point of view the abundance of different formats (for tapes, compression and files) and the lack of a common semantic metadata definition score highest.

File incompatibilities

File incompatibilities lead to the need for transcoding. This consumes read/write storage bandwidth (and processing power). Other problems are caused by inadequate network QoS (typically due to bad design) and legacy system integration, which is time-consuming. In terms of costs, the digitisation of (videotape-based) AV material is reported to easily outweigh the infrastructure costs.

Strategic

The main strategic question for broadcasters is how to guarantee a future-proof archive system. This also relates to the question if one should outsource the archive or have a custom-build one. As a vendor put it: If you build it, 'then how to maintain a system capable of upgrade with an IT platform that has a lifecycle of 3 to 5 years?". Around one third of the respondents use (or intend to use) contracted services for long-term storage and preservation of their content. They outsource for example: the data storage, the system management, all video systems, or even all archive services.

Formats: video, compression, wrapper and media

Current archives mostly contain video in the 576i/25 SD format. Many facilities are undecided about the HD archive format. In terms of compression, currently the intra-formats (D10/IMS and DV-based) are most popular for SD. For the file wrapper, the experienced broadcasters prefer MXF (followed by QuickTime and AAF). Vendors also mostly mention MXF, but include several other formats: AAF, GXF, RAW, AVI and MPEG. As a browse format, current integrated archives report the use of WMV or MPEG-1, but new operations intend to use H.264/AVC. The typical picture for the media format is that data tape is used for long-term storage (LTO/DLT), hard disks for fast access and video tape as a backup for legacy material.

One file format?

In a file-based environment content is no longer dependent on a given media type; it has been virtualized. But is one file format enough? Broadcasters wonder if they should archive in the production format (if there is one), a standard archive format or in multiple formats (e.g. including the native format). Standardising on a single production=archive format means faster access (no conversion needed), no transcode quality losses and a simplified workflow. Vendors seem to prefer the multiple formats approach, arguing that it allows keeping the native format (no transcoding loss on ingest), that infrastructure and workflow constrains lead to multiple formats anyway and that there are too many source and output formats to specify a single archive format.

HDTV

HDTV primarily brings higher quality for current and future use. There are costs in terms of storage and bandwidth due to increased file-sizes, although this does not apply to all formats. The plurality of formats brings transcoding costs (higher costs than with SD - due to higher processing demands), an investment risk and additional integration costs. HD products may be 2-3 years behind SD products, which means HD workflows cannot necessarily replace SD workflows 1:1. The lack of a HD file format standard for high-end content was also raised.

Metadata

In-house developed (proprietary) and Dublin Core based formats are the two most common broadcaster-choices. In-house formats are more frequently specified for internal archive usage, whereas Dublin Core based formats serve mainly for metadata exchange between archive and production. Vendors rarely bring metadata format proposals to the customer, but rather follow the clients' specific requirements.

Level of integration

Broadcasters who have not yet implemented an integrated archive have higher expectations of the level of integration than broadcasters who have already an integrated file-based facility. Vendors seem the most cautious. A phased approach with focus on individual domains (e.g. news, transmission, etc.) is recommended to minimise the investment and risks and to maximise the chance of Return on Investment. Big bang integrations fail due to complexity; technical, operational and ... people (!)

Integration problems

Problems reported with integration:

- Problems with software and middleware modules.
- When using an Enterprise Service Bus (ESB), shifting problems from integrations 'from scratch' towards stabilizing the ESB.
- Network issues
- Automated transcoding issues
- File stubbing issues

System failure handling

Ways in which broadcasters deal with system failure:

- Re-ingest from backup video tapes
- Use data backup/mirroring (raid 1)
- Use hardware mirroring for online storage
- Use procedures including corrupted tape expertise
- Outsource whole storage service
- Some broadcasters admitted they are not prepared for failure.

Catastrophe precautions

Broadcasters reported to use the following precautions against a large catastrophe in their archive:

- Separate location (floor, building)
- Separate storage system
- Data tape duplicates
- Video tape copies
- Disaster recovery technology for the archive system

Project Management

Main problems

1. Broadcaster's organization/workflow is not ready for changes
2. Legacy technology integration is an issue
3. Vendor's awareness of customer's needs is not good enough

Preparation

Broadcasters emphasize the importance of the project preparation phase for both customers and vendors. The preparation phase should at least identify the current responsibilities and workflows.

The technology should also be well known to the broadcaster's project team. Preparation further should include planning of the IT network performance, storage capacity and performance, format conversion needs, metadata scheme(s) and their mappings, and clean up of existing databases.

Over-specification

Vendors regard over-specification a bigger problem than broadcasters. A risk of over-specifying systems is that vendors will try to make solutions more and more flexible, at the same time introducing more and more complexity, and costs (!)

Shared risk mitigation

Archive integration projects can be very complex in terms of technology and workflows. Two project management methods to mitigate the risk may be:

1. To adopt an IT system integration (software specification) process to develop a common understanding of the requirements and a better estimate of the costs and risks.
2. To make sure vendors and broadcaster have a common understanding of the project risks.

Project methodology

Two-thirds of the experienced broadcasters reported not to have used a project methodology. It is perceived as the least important measure to have a successful file-based archive integration project.

Project results

Most broadcasters indicated to have achieved the desired results in their projects, but for over 40% of the projects it was not in time. Reasons given:

- Organization itself not ready
- Internal change management
- Lack of project resources both at vendor's and customer's sides
- Economic problems
- Technical problems
- Technical infrastructure not ready
- Integration issues

Almost all (except one) of these late projects did not use a PM methodology. About 25% of the respondents declared the project did not complete within budget. Reasons given: ongoing technical problems and the need for more investment.

Tips and recommendations

Project management

- Follow a project methodology that best suits your needs.
  - Follow any PM methodology rather than none.
  - Try to use similar PM standards on both the vendors' and your side.
- Specify a precise scope for the project.
- Look at the archive project as a part of a complete digitization strategy.
- Clearly define the specifications.
- Don't take on too much, but plan for a phased integration project.
- Plan your goals with a 5 year time frame in mind.
- Engage key, committed staff members early in the project.
- Ensure an adequate budget (don't forget some safety margin).
- Have a strong project manager (with knowledge and decision-making capacity).
- In addition to the technical project, set up a separate implementation & training project.
- Agree clear escalation rules with your vendors.

Workflows

- The 'as-is' workflow review is critical and can prevent a non-working system.
- Describe and agree on the new workflows internally before making the system descriptions.
- Make sure your workflows are ready and stable.
- Specify a content management strategy to integrate the legacy (videotape-based) archives.
- If possible, digitize key-material of your tape-archive before going on air.
- Reassure staff the master is safe - no need for tapes on the desk anymore.

Change management

- Ensure senior management support.
- Establish an internal change management programme to involve all users.
- Plan the workflows and potential organizational changes before choosing proper technology.
- Include adequate training and a full scale trial run should before system launch.

Technology

- Ensure good technology support, to guarantee technological continuity.
- MAM system expectations can be surrealistically high. Beware of the hype!

Top-down approach

1. **Specify your business goals**
   This does require at least some awareness of new technology capabilities. Therefore, a multidisciplinary (business, technology, PM) person/approach is encouraged.
2. **Find their implications on a functional and workflows level**
   Planning the workflow is a crucial stage of the project. An essential part of a workflow plan is a designation of user profiles / competencies.
3. **Clearly define the functional and non-functional requirements**.
   Document them.
4. **Have an open discussion with vendors and integrators to verify the requirements.**

This is just about being realistic. Many tenders fail due to over-specification or through demanding functions that are hard to implement (within a given budget).

5. **Select technology that best suits the requirement**
   This usually means a selection within the tender procurement.

Role of the EBU

Broadcasters expect standardised solutions to create integrated file-based archives. Vendors do not necessarily provide those, depending on their business interests, but also as they are not always asked for them (e.g. in tender processes). Both broadcasters and vendors agree the primary role of the EBU should be to publish recommendations on standards and user requirements. Also, the EBU should inform where the relevant standards are in their lifecycle and what impact the standards are having on real-world use of related technologies. Less-experienced broadcasters put emphasis on the EBU providing a technology map with completed integration projects by broadcasters and on sharing of Members' experiences.

Potential future studies

- Use of broadcast archives more for educational and social memory purposes.
- New revenue channels with file-based archives (e.g. preview & file-delivery).
- Selection criteria for archiving web content (e.g. legal obligations, reuse of elements).
- (How) To archive emerging channels, such as 7-days catch-up TV and Internet Portals?
- Open storage (interfaces, protocols). Also to minimise integration time with new products.

Relevant EBU work completed or already ongoing (May 2010)

- EBU Core metadata specification (EBU Tech 3293) - based on Dublin Core
- Loudness normalisation (see the EBU PLOUD Group), relevant when ingesting legacy material
- MXF interoperability is addressed in the EBU HIPS MXF Group
- New codecs for 1080p/50 material are being tested in the EBU HIPS CODEC Group.
- Services interoperability is addressed by both the EBU and AWMA in the FIMS initiative

For more information on these activities and more, see: http://tech.ebu.ch

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Archives Report 2010

Keywords: Digital Television Archive, Technology, Organization, Project Management

1. Introduction

EBU Members frequently need advice on specifying and using archive technology. Their questions relate to technical issues (formats, architectures, etc.), organisational issues (workflows, tendering, etc.) and project management.

Many of these issues are not archive-specific and have to do with the use of IT-based technology for broadcast production facilities. These issues are addressed elsewhere, by the EBU Group on Networked Production (NP), for example.

To address archive-specific topics, the EBU set up a Project Group on Digital Archives Technology Advice (P/DATA). The Group started its work in April 2009 with the task of gathering practical experience from Members and Vendors and to report on the main problems, questions, answers and requirements.

The P/DATA Group used various surveys (questionnaires) and meetings, both with Broadcasters and with Vendors to gather its data.

This report summarizes the current technical and workflow issues found for setting up digital archives and integrating them in a television environment.

2. Survey results - general information

2.1 Organization

The survey questions were identified and prioritized by P/DATA participants. The survey itself was split into three different sets of questions:

Survey 1 A brief survey to help respondents identify how 'file-based' their organizations are.

Survey 2A For partially file-based facilities (arguably the 'less experienced' users).

Survey 2B For integrated file-based facilities (arguably the 'experienced' users).

Respondents were recommended their 'appropriate' experience category based on their responses to Survey 1, but they could nevertheless select the category they belonged to for themselves.

2.2 Documents

The survey was accessible both by e-mail (distribution of PDF documents) and online (using SurveyMonkey). Respondents were initially addressed by e-mail and encouraged to fill in both Survey 1 and subsequently their appropriate Survey 2. Skipping of questions was allowed in the case that they could not be answered.

2.3 Participation

Over 100 organisations were initially addressed. The responses received were as follows:

	Survey 1	Survey 2A	Survey 2B
Broadcasters	50	16	17
Manufacturers	8	1	9
Archives*	1	0	1
Unidentified**	3	1	0
Totals	**62**	**18**	**26**

**Archive service providers external to Broadcasters*

***Surveys without an e-mail address were not taken into account, as the type of organisation could not be established without it.*

Note: the size of both surveys 2A and 2B was large (Survey 2B contained 78 questions); therefore the above figures are very good response rates.

2.4 Scoring

Results are shown in the order of importance, based on the total score.

Weighting factors are used. For example: not important = 0 points, a bit important = 1 point, etc.

If the total score is the same for two items, the order is determined by the highest score in the highest category where they differ (e.g. first the item that has most very important points).

Typically the five most important results are shown with a black font, the remaining results are grey to indicate that they are of less importance.

The scoring is normalised by dividing the actual score by the maximum score that all respondents could have given.

3. Workflows

3.1 Place, role and benefits of a file-based archive

Place

In your organization, is the archive at the end of the operation or distributed across it?

Integrated file-based facilities

Broadcasters

The survey shows that in integrated file-based facilities the archive is usually distributed (workflow-wise) throughout the television operation.

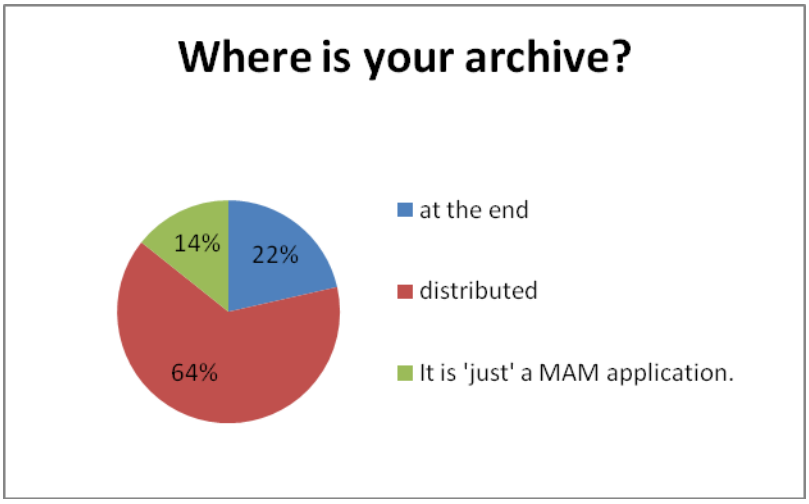


Figure 1: (Experienced Broadcasters' responses)

In other words, 'the archive can serve the whole tapeless workflow from ingest of programmes before transmission to long-term archiving of the programmes and the production materials.'

Vendors

Technology Vendors tend to treat a digital archive as just one of the MAM (Media Asset Management) applications. It is even regarded as being a media HUB for the whole facility.

In a distributed archive, the Essence (audio & video) and the associated Metadata are managed at every step of the workflow, based on business rules – the archive's borders are transparent to the users. End users can trigger archiving at any moment in the production cycle, including at ingest.

'Distributed archive' does not imply that all the work of entering Metadata or managing media is manually done by archive-personnel. But the selection of Metadata and the Metadata standards that are applied should be maintained and controlled by the archive.

Even if the core 'archiving' process is still at the end of the operational chain (the final cataloguing process takes place at the end of production), the whole operation starts much earlier and this is why we speak of an integrated archive.

Partially file-based facilities

Broadcasters

The results resemble those for integrated and file-based environments (see the diagram below), with a slight shift of the archive placement towards the end of the operational chain (the more traditional approach). Some Broadcasters notice that although still in its traditional place the archive is 'moving towards a more distributed position as file-based workflows are adopted in the organization'. Some Broadcasters confirm they 'are in the middle of the process of making the archive part of their overall MAM system'.

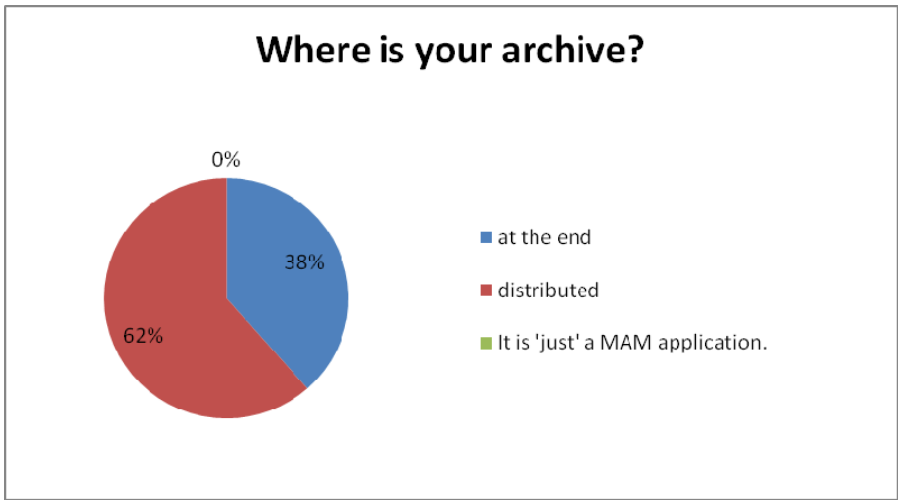


Figure 2: (Less-experienced Broadcasters' responses)

Role

Integrated file-based facilities

Broadcasters

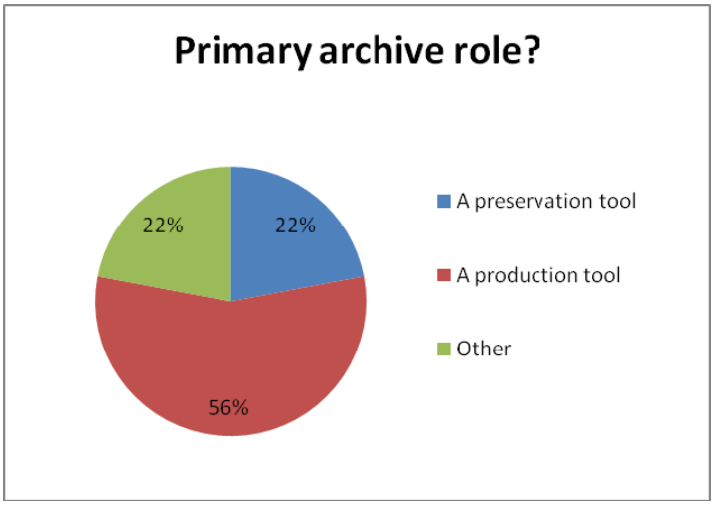


Figure 3: (Experienced Broadcasters' responses)

The archives' roles vary, as the primary drivers for Broadcasters differ. As several Broadcasters responded (under 'other' in the figure), the archive can be regarded both as a production and as a preservation tool. With new technologies and workflows, ingest and transmission are now implemented as roles of an integrated archive.

Vendors

Real benefit comes from a combination of preservation, production and reuse. Also, a specialization following business drivers is observed:

- The news archive is usually specialized and highly integrated with the news production workflow.
- Transmission archives are again highly specialized with clear I/O performance requirements and the ability to share storage platforms.

Partially file-based facilities

Broadcasters

The results are similar to those in integrated file-based facilities.

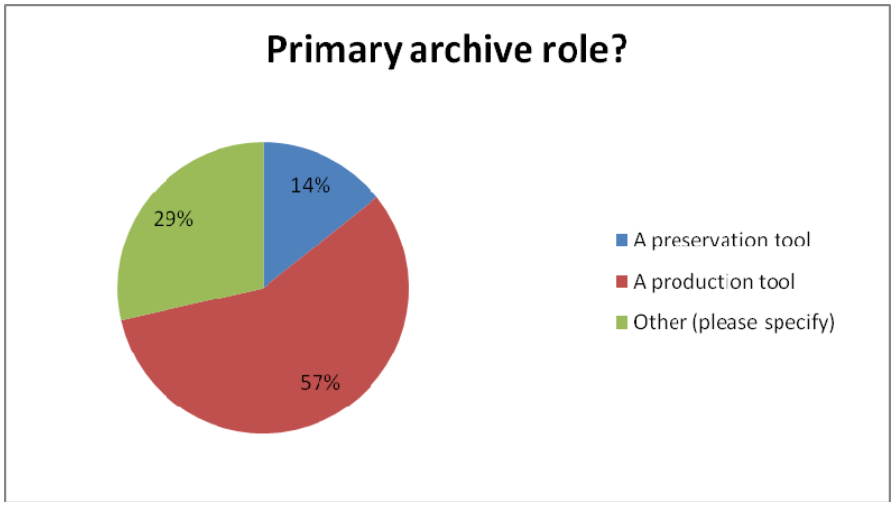


Figure 4: (Less-experienced Broadcasters' responses)

This might imply that:

- the archive role is technology independent and does not change if the business model remains the same
- it is too early to see the global impact of technology change on the business model.

On the other hand, one of the Broadcasters mentioned that new opportunities are expected with regards to the archive's role, such as educational services to the public. Public service archives could also function as a social memory of a territory.

Benefits

Integrated file-based facilities

Broadcasters

A modern television archive is all about concurrent access and reuse/more use of the material.

Top 5 archive benefits

	Benefit	Scoring (normalized)
1.	Concurrent access	88
	More usage of archived material	88
2.	Smarter searching	80
3.	New integration options - e.g. automatic output to new media platforms	79
4.	Proxy workflow	77
5.	Reduced operational costs	73
6.	Better quality (e.g. less copies)	70
	Automatic ingest / annotation support	70
7.	Reduced time to market	66

8.	Content history tracking	64

(Experienced Broadcasters' responses)

Importance	Range
Important to very important	75 - 100
neutral to important	50 – 75
bit important to neutral	25 – 50
not important to bit important	0 – 25

New functionalities such as smart search and proxy view/edit provided to the end user's desktop, together with new integration options allow for more efficient media usage – both in terms of overall operational costs and time to market. This is especially true for the use of preview-proxies, which are almost a given with any file-archive. The largest reduction of effort is then to be expected in the journalist's workflows, where the desktop-access to the archive-content replaces the time-consuming process of repetitive tape-viewing.

The benefits of having more secure material management (no loss of the original tapes) with better quality assets (less generation losses) was also mentioned.

Vendors

Overall reduction of operational costs and more technology support for traditional human tasks (ingest, annotation) –are stressed by Vendors more than by Broadcasters.

Top 5 archive benefits

	Benefit	Scoring
1.	Concurrent access	89
	Reduced operational costs	89
2.	Automatic ingest / annotation support	83
3.	More usage of archived material	81
	Smarter searching	81
	New integration options - e.g. automatic output to new media platforms	81
4.	Better quality (e.g. fewer copies)	78
5.	Proxy workflow	67
6.	Reduced time to market	64
	Content history tracking	64

(Vendors' responses)

Vendors gave a pragmatic view of customer expectations, where 'some features are requested at RFP level, but then are never purchased due to integration issues or cost.'

The benefit of having 'smarter searching' was questioned, as 'In most cases the request is for 'dumber', Google-like' searching. Here, one has to be careful. A demand for a user-friendly interface and ease of making queries does not necessarily equate with lessened expectations towards the efficiency of the search engine (which is not always realized). Instead one should consider engaging a good archive specialist in the process of requirements definition, even if you plan to completely delegate search tasks outside of the archive – e.g. to the journalists.

It was also pointed out that the file-based approach brings the important benefit that the Content is no longer dependant on a given media type; it has been virtualized. That is why better 'future proofing' of Content formats and better adaptation to new formats (e.g. HD) are expected.

Partially file-based facilities

Broadcasters

The less experienced broadcasters predict similar future benefits as the Vendors showed to have experienced. Both groups anticipate more Content usage, smarter searching and concurrent access. It is worth noting that there are greater expectations with regard to better quality of the archive – in terms of the Content itself, as well as for the Content Management (which is rather unspecified and could be interpreted as needing more effort for cataloguing and indexing).

Top 5 archive benefits

	Benefit	Scoring
1.	More usage of archived material	86
2.	Better quality (e.g. fewer copies)	80
	Smarter searching	80
3.	Concurrent access	79
4.	New integration options - e.g. automatic output to new media platforms	75
5.	Content history tracking	71
6.	Reduced operational costs	70
	Proxy workflow	70
7.	Automatic ingest / annotation support	68
8.	Reduced time to market	63

(Less-experienced Broadcasters' responses)

Some additional benefits were also indicated:

- automated Content migration possibilities, which fits well with the Vendors' assessment of Content virtualization
- better tools to efficiently manage usage rights

The financial aspect has not emerged as a priority. In the survey the 'cost argument' received rank six from the Broadcasters who are not fully file-based yet, though one respondent believed the operational costs might be reduced by 40%.

One point that could be examined more closely in future studies is the concept of gaining new revenue channels by introducing a file-based archive. The market for audio-visual material is growing, while at the same time preview access and file-delivery technology provide new marketing opportunities. This effect probably is already included under the archive benefits nos. 1, 3 and 5. Nevertheless, opening up to new, external markets deserves attention as an independent factor.

3.2 Archive integration within the television production workflow

Integrated file-based facilities

Broadcasters

The order in which to integrate the archive in the production workflow depends on at least two factors: business needs and technological/organizational constraints.

The most common business drivers demand the automation of the Content flow, from ingest, through production/NRCS, to play-out, with the archive serving as a Content repository throughout the whole chain.

Typical order of archive integration

Integrated area/system	Scoring
1. Newsroom operation (NRCS)	91
2. Content ingest	82
3. Play-out system	69
4. Legacy (tape-based) archive	47
5. Craft media editing (NLE)	44
6. Channel planning	38
7. Graphics editing systems	16
8. New media distribution platform	13
9. Production planning	0

(Experienced Broadcasters' responses)

Priority	Range
Low to High	1 – 100

However, digital archive integration in a television workflow is also highly dependent on the technology platform used for a given implementation.

Once a MAM system is implemented, the digital archive is often just one of the possible applications – also including ingest, NRCS, play-out, etc. Even if not all of the applications are delivered at once, later integration between them is usually not an issue thanks to common workflow mechanisms and common Essence/Metadata management.

The need for integration with systems external to the MAM-based archive usually originates from two reasons:

1. There is existing technology

- integrating modern archive software with for example:
  - existing license-management or planning systems
  - a legacy archive-system which cannot be replaced
  - existing NLE or other production-technology

2. Systems are kept independent

- technology-wise,
  - to reduce complexity in order not to rely too much just on one super-system or as a form global disaster protection
  - as the result of a strength/weakness analysis of the MAM and archive system
    - the MAM's data-model is not appropriate for the sustainable management of Content-Metadata
    - the MAM's search capabilities are not sufficient for the data-model and/or the amount of records related to the required result-speed
- organizationally,
  - for example because departments resist changes in the organization's structure and workflows

Therefore, a phase in which to plan the workflow and potential organizational changes should be considered before choosing proper technology.

Vendors

In general, Vendors and Broadcasters similarly prioritized the order of archive integration. With regards to the relationship between old and new technology. However, Broadcasters pay much more attention to issues of preserving the use of their (tape-based) legacy archive within an integrated file-based environment.

Typical order of archive integration

Integrated area/system	Scoring
1. Newsroom operation (NRCS)	80
2. Content ingest	63
3. Play-out system	40
4. Graphics editing system	38
5. Craft media editing (NLE) - first (high priority)	28
6. New media distribution platform	25
7. Legacy (tape-based) archive	13
Production planning	13
Channel planning	13

(Vendors' responses)

Experience shows that some Vendors propose to shift this integration problem toward a 'change all' (to the file–based) approach. That is why a clear Content management strategy and workflow requirements with regard to legacy media should be planned by Broadcasters before implementing a digital archive.

3.3 Changing tasks

Integrated file-based facilities

Broadcasters

In a world of Content virtually detached from physical media, the physical barriers between users and assets vanish. The desired competences and workflows become the new focus point. Licensing and other rights issues show up as a remaining challenge.

The main workflow change for a newsroom/production department is the introduction of more 'self-service': journalists/producers can have more direct access to the Content, based on predefined privileges.

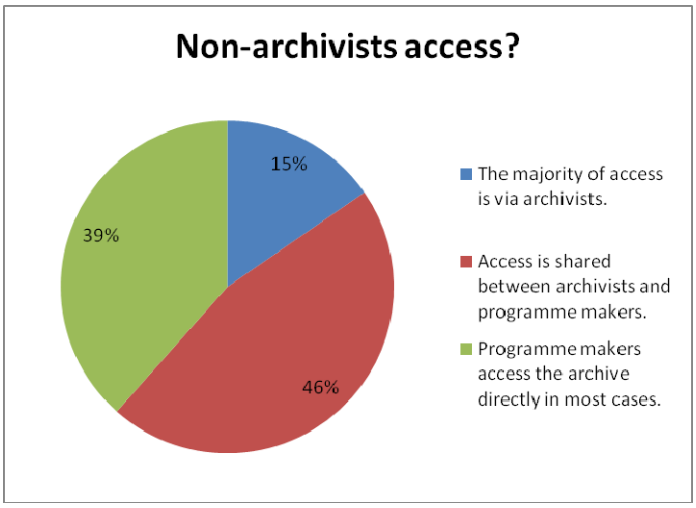


Figure 5: (Experienced Broadcasters' responses)

They can trace the Content from their desk through almost the whole production chain. This makes it easier to use material, but it also changes their role from Content users to Content 'owners'. The extra freedom also means more responsibilities.

Metadata is provided with the complete Essence flow. It is either added directly into the archive system by Content users/producers (who were assigned new responsibilities) or by former archivists, who moved from the end of the process (traditional archive cataloguing) to, for example, an ingest area.

Typically, basic Metadata is input by journalists and production users as it is needed in their production workflow, while archivists check for Metadata consistency and provide additional Metadata. Archivists also maintain annotation and search tools by creating indexes, dictionaries, filters, etc. Their new name is 'Content manager', though in some cases 'media manager' is used in the interim.

Even though a large part of the archiving process is automated, Content that has been broadcast or material that has been ingest still needs to be annotated (if it has not already been annotated earlier). Content producers can trigger archiving of their own material (e.g. edited items) directly (see separate question on the 'decision to archive').

Partially file-based facilities

Broadcasters

Currently over 50% of the Broadcasters with partially file-based facilities do not allow for independent access to the archive material. This is done for two reasons:

- licensing and related rights-issues control
- physical media traffic management

The future effort to manage media will decline while the effort to manage Content (Audio/video with its associated Metadata) will rise. Thus, most of the expectations regarding changing tasks can be summarised as 'less media management, more Content management'. This implies the following changes:

- No/less physical media flow will eliminate/reduce the need to manually handle media movement by archive staff. At least as soon as the legacy tape-material is transferred to files.
- On the other hand, the automation of the media flow will require more careful Content management throughout the whole production process, with emphasis on Metadata gathering.
- Some meaningful Metadata input will hopefully be supported by automatic indexing

algorithms, also more Metadata useable for automatic ingest processes will be delivered by external sources (news agencies).

- More responsibility for use/misuse of Content will be on the user/programme side.

The archivists will shift the focus of their work to evaluation (Metadata Controlling) of the assets by verifying and enhancing the Metadata, providing better search options, providing training and advice etc. One has still to consider that some of the core Metadata requirements of television archives – e.g. the picture description – will not easily be replaced by technical analysis.

3.4 Organizational challenges in implementing new workflows

Integrated file-based facilities

Broadcasters

Many organizational challenges experienced during digital archive implementation derive from corporate problems not specific to the media industry:

- Reluctance to change the current workflow, lack of cooperation between departments, lack of awareness of current work processes.

Biggest organizational challenges

Organizational challenge	Scoring
1. Lack of a 'Metadata culture'	65
2. Reluctance to change the current workflow	63
3. Lack of cooperation between departments	52
Lack of awareness of current work processes	52
4. Lack of non-linear thinking	48

(Experienced Broadcasters' responses)

Challenge	Range
Quite a challenge to big challenge	75 - 100
Challenge to quite a challenge	50 - 75
small challenge to challenge	25 - 50
not a challenge to small challenge	0 - 25

As can be seen above, a lack of a 'Metadata culture' and a lack of non-linear thinking were also observed.

Additionally, project management related issues were indicated: 'The tight project schedule combined with a very small project organization was a huge challenge, especially at the implementation and training phases.'

Proper HR planning and organizational change management are needed. An example given by one of the respondents reflects the difficulty of departmental reduction policies accompanied with an overall role change process.

Vendors

Vendors prioritize organizational challenges in the following order:

Organizational challenge	Scoring
1. Reluctance to change the current workflow	72
Lack of cooperation between departments	72
2. Lack of awareness of current work processes	69
3. Lack of non-linear thinking	63
Lack of a "Metadata culture"	63

(Vendors' responses)

Additionally, vendors identified the following organizational challenges not listed above:

- **dealing with users habits and concerns**
  - 'You will have to reassure producers and directors that their masters are safe! They no longer have a master tape on their desk, so they may be worried about the digital master being lost.'
  - 'Too many Archive implementations are Big Bang - they take on too much, try to integrate too many systems. Digitisation is an evolution through a number of phases. In many cases the result of phase 1 is different from the expectation and the overall strategy changes.'
- **dealing with specific project management processes or the complete lack thereof**
  - 'Lack of top-down vision'. The first requirements are often specified in terms of codecs and hardware, but the most important requirements in practice are:
    - 1. What do I want to achieve at the business level?
    - 2. What are my functional requirements to achieve this?
    - 3. What technical requirements can I derive from those?
  - 'The AS-IS workflow review is usually a surprise - this is a critical step. Missing this out causes significant delays and confusion on project implementations when users really get to work on the system. This is also an important 'bringing the users on board' aspect of the project - this is usually seen as too expensive to do, but it is cheaper than the alternative wherein the system does not work.'
- **dealing with tender processes**
  - 'Current tender processes (especially in the EU) do not really allow for evolution of ideas required to move from a linear world to a non-linear world. Can we make the Competitive Dialogue process a good fit for this? Initial tenders have been difficult and expensive.'
- **dealing with high expectations**
  - Expectations of technology and especially MAM systems can be surrealistically high. 'HYPE - MAM can do anything and faster.'

The results of this section show that organizational reforms that lead to the integration of archivist's job descriptions to neighbouring working fields (journalistic and/or technical) and vice versa can be an important prearrangement to set up digital and future-proof archiving workflows.

Partially file-based facilities

Broadcasters

Biggest predicted organizational challenges

Organizational challenge	Scoring
1. Lack of a 'Metadata culture'	79
2. Reluctance to change the current workflow	64
3. Lack of awareness of current work processes	59
4. Lack of cooperation between departments	57

5. Lack of non-linear thinking	52

(Less-experienced Broadcasters' responses)

Here also, 'lack of Metadata culture' problem was seen to be the biggest organizational challenge.

Although the 'reluctance to change the current workflow' problem scored 'only' the second position (issue #1 for the Experienced Broadcasters and Vendors), some of the Broadcasters seem very much aware that changing the workflow might be a challenge, as they already observed:

- 'Lack of determination inside organisation in implementation of technological and organisational changes'
- 'Lack of management understanding of the challenges and Interdependencies'.

3.5 Non-organizational problems in implementing new workflows

Integrated file-based facilities

Broadcasters

Biggest non-organizational challenges

Non – organizational challenge	Scoring
1. Transcoding between different formats-islands	52
2. Network QoS	34
3. Integration with legacy archive systems	27
Geophysical locations	27
4. Legal issues	14

(Experienced Broadcasters' responses)

The biggest non-organizational problems that Broadcasters experienced during digital archive implementation are technical ones. More in-depth comments on this have been provided by Vendors (see below).

Vendors

Biggest non-organizational challenges

Non – organizational challenge	Scoring
1. Transcoding between different format-islands	69
2. Network QoS	56
3. Geophysical locations (different buildings)	47
4. Integration with legacy archive systems	44
5. Legal issues (please specify)	22

(Vendors' responses)

In general, Vendors confirm the importance of top ranked technical issues experienced during implementation:

- **Transcoding between different format-islands**
  - 'File incompatibility is the biggest single bottleneck in a system – partially because of transcoding performance, but mainly due to its high use of storage bandwidth for read (and write).'
- **Network QoS**
  - 'The network is an integral part of the design. A close relationship between the Vendor and the information systems (IS) network specialist is critical.'
  - '…where a customer IS department is designing the network there can be real issues with

the QoS. We provide customers with a network expert who will work with them to design the complete network to assure a high quality service.' [a Vendor]

- **Integrating with/migrating from legacy archive system:**
  - 'Integrating/Migrating existing legacy databases can be a real issue'.
  - 'Most of the time, the migration from legacy databases can be a problem, mainly because it is time consuming.'
  - 'Metadata migration from the old legacy archive system to the new Media Management System (MMS) was seen as being essential before the full implementation of the MMS - great from the archive's perspective. The more challenging part was to integrate a quality search tool to the MMS's native search interface.'

Also, some additional problems were presented:

- **Digitization process costs**
  - 'But the digitization of the A/V material is the real bottleneck. The cost of digitization can be significantly higher than the technical infrastructure cost.'
- **Quality of Service**
  - The integration of the archive and the tape-less production system must have proven deterministic QoS, it must support the mixing of video and audio types across the storage and product chain, and it must provide flexible Metadata exchange technology.

One of the Broadcasters noticed the importance of proper preparation after the implementation of a digital archive and its integration with other parts of the production chain, so there is enough time to test the workflow before going on air.

3.6 HDTV's impact on archiving workflows

Higher quality of the Content is the most important opportunity that HDTV brings to file-based archiving workflows, according to the survey. This translates into:

- better quality preservation, future-proof archives
- better quality for production, transmission

However, there are also challenges:

- **Big files**
  - Increasing the demands on capacity and bandwidth / costs of storage and network
  - Partial retrieval becomes a more important feature
- **Too many different formats used by equipment Vendors**
  - Transcoding of big files requires very high processing power
  - Lack of a widely accepted standard by technology Vendors means there is an investment risk and a risk to face integration problems
- **Technology immaturity**
  - 'Integration of HD products is between two to three years behind SD integration. SD workflows cannot translate directly into HD.'

3.7 Retention strategy

Integrated file-based facilities

Broadcasters

With the introduction of file-based archiving, the retention strategy does not change radically, as regards the selection criteria. What does change are the quantity of archived materials and some quality aspects. For example complex (project-like) media formats used by NLE technology can now

suddenly be archived, introducing versioning challenges.

Also, thanks to the archiving process being cheaper and less time consuming, more rushes are stored in an archive.

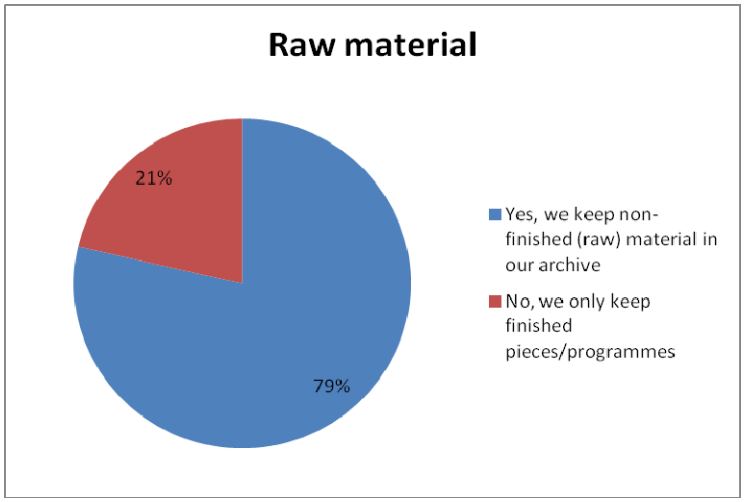


Figure 6: (Experienced Broadcasters' responses)

Given the much higher flow of Content, proper media referencing has become more important. As one respondent put it: 'some departments have become more aware of the fact that they have to give input to the archivists'.

Still, the 'select some' strategy is commonly used, with the 'long term value' and 'most used' criteria usually being taken into account.

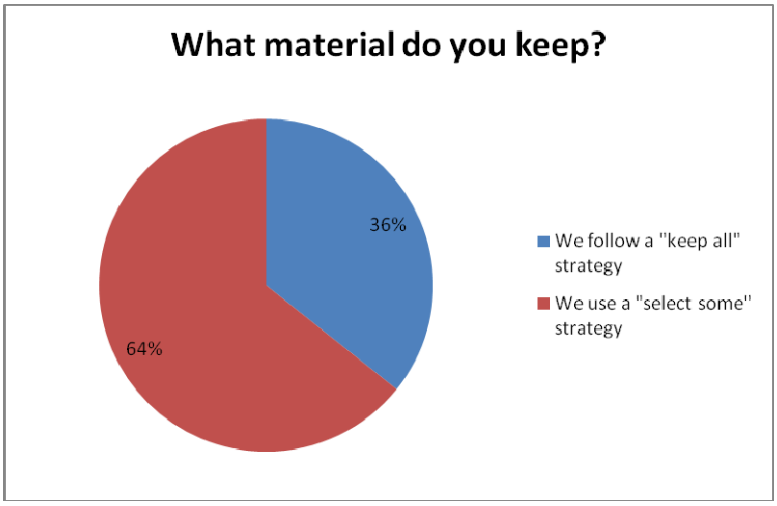


Figure 7: (Experienced Broadcasters' responses)

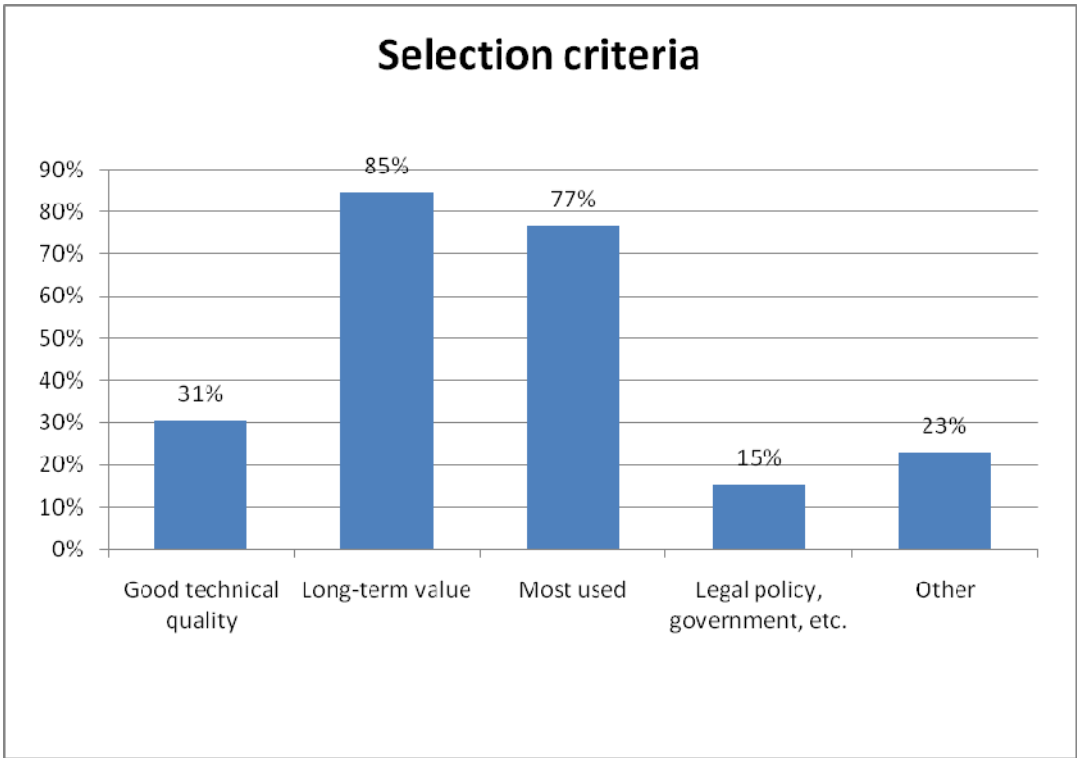


Figure 8: (Experienced Broadcasters' responses)

The decision as to what is kept differs with Broadcasters' workflows. Generally, there are three options:

- The decision is still up to the archivist
- The user proposes, the archivist verifies/accepts (most common)
- The decision is up to the user/Content creator

The 3rd option requires a high discipline in Metadata provisioning. That is why one of the Broadcasters advised the following solution:

1. Content is selected by the user and sent to an intermediate archive (limited life-span – e.g. 3 months)
2. Metadata is provided within this limited period. If not, the Content is deleted.
3. The Metadata is verified by an archivist, and then the Content is moved to a deep archive.

The results show that in most cases the professional archivists remain involved in archiving decisions. The simple fact that it needs a company-wide strategy to be implemented, calls for an institution that develops, controls and finally enforces this strategy. But of course the 'distribution' of processes gives room for the delegation of tasks where clearly defined retention rules allow for 'distributed' archiving.

With regards to transmitted material, these rules will be rather easy to implement because one can organize them along the predictable transmission schedules. As soon as raw-material and raw versions come into scope, the skills and experience of professional archivists to overview and to monitor for re-use will contribute substantially to improve strategy enforcement.

Partially file-based facilities

Broadcasters

Most of the Broadcasters are still not certain if and how the retention strategy will change with the introduction of file-based archiving.

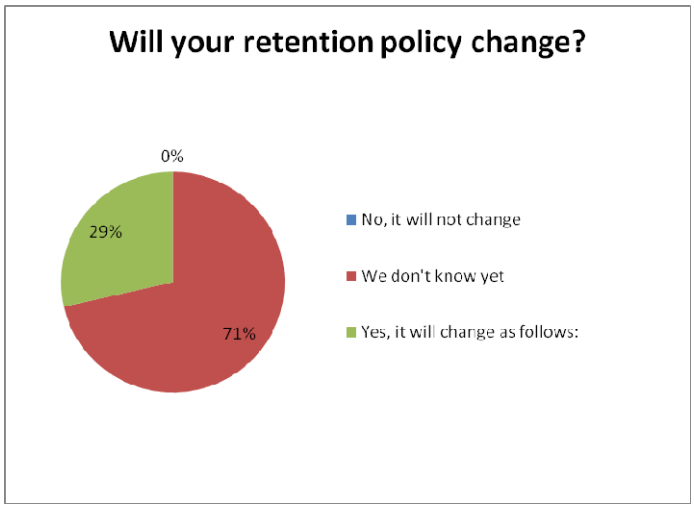


Figure 9: (Less-experienced Broadcasters' responses)

The selection criteria used by broadcasters which do not have a full file-based operation yet, are almost identical to those used in the integrated file-based facilities. What differs most is the retention responsibility. The less there is integration, the poorer is the distribution of decisions outside of the archive.

As far as the Content itself is concerned, it is believed that the retention policy might change, though the decisions will be driven by storage costs. Nevertheless, some broadcasters predict that a 'file-based archiving will allow adjustment of the retention policy to implement archiving of items that would previously have been deleted or lost'. That may be reflected in the slight growth of raw materials reported to be stored in the archive (from 77% for the less-experienced to 85% for the experienced broadcasters).

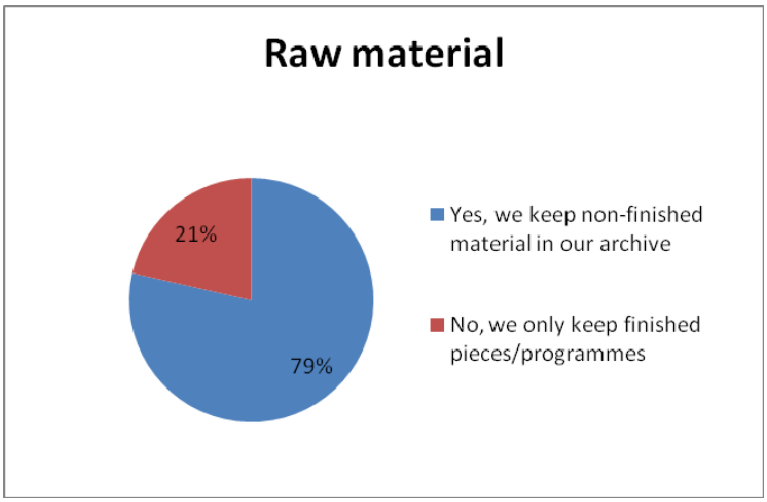


Figure 10: (Less-experienced Broadcasters' responses)

One of the Broadcasters recommends a new retention strategy: 'Less selection (elimination) of Content. A strong selection at the level of documentation by archivists'.

3.7.1 Archiving of web Content

Integrated file-based facilities

Broadcasters

Currently, most of the Broadcasters do not archive web Content, or they archive only the web Content which is produced in-house.

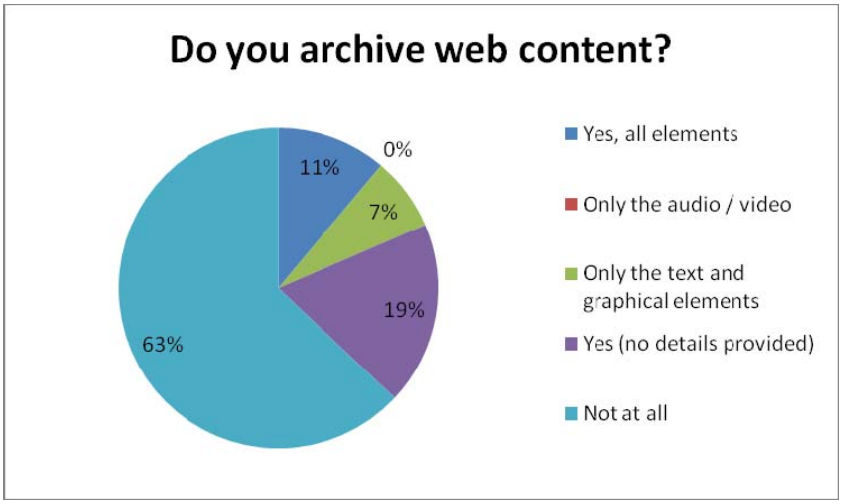


Figure 11: (All Broadcasters' responses)

Generally, two types of web Content archiving should be considered:

- Archiving of web Content created in-house
- Archiving of 'external' web Content

For in-house web Content, archiving is usually an add-on benefit of managing the web creation/presentation platform for the Broadcaster's own Content. As long as the presentation mechanisms can be recreated, there is even no need to archive web Content in a static presentation form.

For externally created Content, some fundamental questions arise:

- What are the selection criteria?
  A closer future examination of web archiving probably should ask for the reasons to archive.

  The obvious reasons could be:
  - legal obligations
  - re-usability of Elements as raw material
  - other

Also the archive handling of the emerging 'Channels' such as '7 days catch up' Internet Portals deserves attention.

- In what form should the web Content be archived?
  - do we archive only the information (text with associated media, pictures)
  - do we archive the information and the look and the behaviour of a given piece of web Content (the fonts used, page layout, references, interactive features, etc.)

Although there are many national initiatives to archive external web Content, they are mostly still in an experimental stage. However, bearing in mind the pace of development of web Content presentation technologies and the back-end IT infrastructures needed to support them, web Content archiving with look and behavioural parameters seems questionable, unless limited to a

narrow selection of websites.

Partially file-based facilities

Broadcasters

Generally, less of the Broadcasters care to archive their web-Content if an archive is not file-based and integrated with their WWW platform.

Many of those who do archive web Content declared to archive only the text and graphical elements, which was not the case for Broadcasters with an integrated environment.

3.8 Rights management

Integrated file-based facilities

Broadcasters

Rights management is referred to here as *usage rights*, e.g. "Can I use material X in programme?" Different types of usage rights include:

- license rights
  The availability or absence of formal license-rights for a certain piece of Content and (!) a certain distribution channel.
- personal rights
  Especially in the case of news- and documentary- Content the enforceable human right to be shown in an appropriate context brings special challenges for the re-use of archive material.
- strategic usage rights
  Very often the policy of departments allows for footage usage only in certain contexts.

Broadcasters undertake the following efforts to best organize the management of the *usage rights* of their Content:

- Integration of the archive with a contracts database
- Using a minimum number of different contracts
- Tracking the complete edit history of the material
- Other, including:
  - File nomenclature
  - Textual description

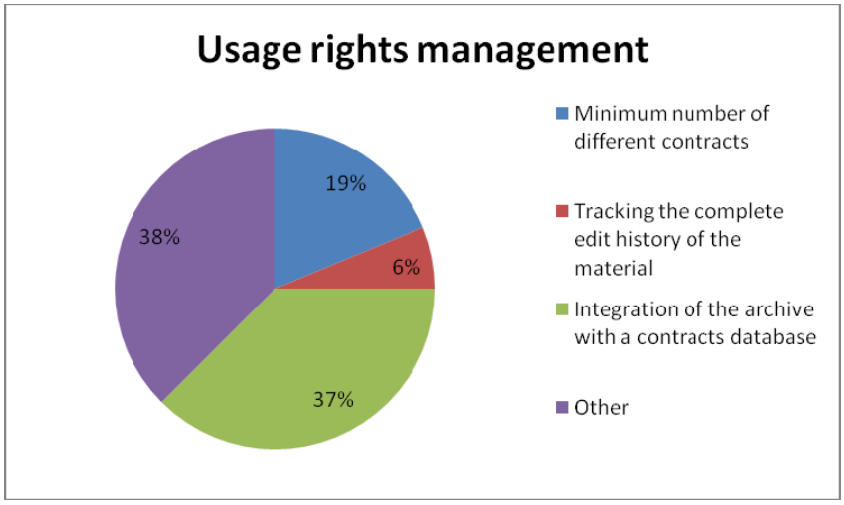


Figure 12: (Experienced Broadcasters' responses)

Concretely, broadcasters should:

- Manage their contracts in such a way that the usage rights information is unambiguous, easy to understand and easy to import into a contracts database.
- Have a contract database, allowing for structural Metadata management.
- Have a contract database integrated with (or within) the archive system, so there are no limitations on the desired information flows between them.
- Have a functionality allowing searching of the archive system by using the usage rights criteria: 'Most solutions tend to access some form of traffic-light data for the digital archive in high speed environments, such as news.'
- Be able to trace the media history, e.g. what other media it consists of, and what are their usage rights.

Partially file-based facilities

Broadcasters

The importance of usage rights management seems less recognized here, as more access is human dependent. Some general rules nevertheless apply:

- 'We try to minimize the number of different right contracts';
- 'The usage rights are kept to a minimum in the contract with the producer';
- 'We try to have rights on future use on all vectors of distribution, also online'.

Some Broadcasters already use license management software. One of them claims to have integrated it within 'a traffic system, which is linked with the archive catalogue'.

3.9 Workflows - conclusions

There are substantial expectations to potentially change and adapt workflows in the course of the implementation of a digital archive.

Archival skills reconsidered

Basic archival skills such as operating advanced Metadata systems (in the organizational as well as in the technical sense), being able to perform comparative selection and being accustomed to performing efficient and reliable collaborative service work, are qualities that are now needed throughout the Broadcaster's workflow chains. The job titles employed are usually those of media- or Content manager. The latter refers to a higher responsibility that already includes parts of the complex subject of usage rights, with its many implications for broadcasting operations, including online Content.

Job Descriptions become diffuse

The former boundaries between job descriptions and titles become diffuse and inevitably mingle. Some archivists may start performing journalistic selection and perhaps even production and will thereby be advised by experienced journalists. Others may perform basic digitization and ingest work – in this case under the supervision of skilled technicians. Some will do annotation-work, including basic rights annotation, and they will be guided by experienced members of the licensing departments.

In these ways archivists can expand their acquired journalistic perspective on material selection to the legal dimension of license- and copyrights. This elaboration could easily be broadened towards further business areas e.g. the integration towards marketing and footage sales or controlling Content (with regards to efficient use of archive material in production departments).

Complementing this, journalists and technicians (for example) will do basic search-, annotation-, and selection-work with support, under supervision and along the guidelines developed by the archives and documentations departments, who will be a sort of competence centre for Metadata management.

This mutual amalgamation of skills will not come by itself; it will require a proper HR management alongside the technical change process.

Self Service does not come unconditionally

The (in principle) foreseeable further formalization and integration of the abovementioned know-how into the archive- and MAM-databases will, over time, transform archive use into a self-service operation for the journalists in more and more areas. This also means that journalists will have a higher responsibility and need better training in correct and efficient use of archive assets.

This transformation will not arrive in isolation; it will require powerful archival 'back office operations' to maintain the Metadata at a quality level that allows for true and sustainable self-service. It is commonly expected that further automation and integration will make room for this Metadata maintenance work in the archives.

The need for competence-centres

The overall challenge must be to allow for an organization where the core qualifications of archivists, journalists, technicians and license managers are maintained in synergy to form efficient and strong competence centres, but wherein the job descriptions allow for structured diffusion.

4. Technology

4.1 Technical problems

Integrated file-based facilities

Broadcasters

Broadcasters rate technical problems they experienced in the following order of importance:

Top 5 technical problems for Broadcasters

Technical problem	Scoring
1. Interoperability problems between Vendors	93
2. Technology non-maturity	63
3. Too many formats (e.g. video tapes, compression, files) to support	55
4. Lack of adequate, state of the art APIs	45
5. Legacy integration hurdles	43
Lack of a common semantic definition for Metadata exchange	43
6. Scaling-up problems	38

(Experienced Broadcasters' responses)

The 'Interoperability problems between Vendors' issues clearly dominated this ranking.

Vendors

Top 5 technical problems for Vendors

Technical problem	Scoring	Scoring
1. Too many formats (e.g. video tapes, compression, files) to support	24	67
Lack of a common semantic definition for Metadata exchange	24	67
2. Legacy integration hurdles	22	61
Interoperability problems between Vendors	22	61
3. Lack of adequate, state of the art APIs	17	47
4. Scaling-up problems	16	44

5. Technology non-maturity	14	39

(Vendors' responses)

Vendors seem to perceive the interoperability problems through practical obstacles they experience during the implementation:

- Too many Essence and media formats
- Lack of a common semantic definition for Metadata exchange

For Vendors the 'interoperability problems between Vendors' problem is ranked lower than for Broadcasters.

A considerable concern with regard to legacy integration was also shown, although this point was not so strongly rated by Vendors in other rankings (compare the sections on 'Archive integration within the television production workflow' and 'Non-organizational problems in implementing new workflows'). It was stressed that when integrating legacy databases, 'customers must define their Metadata schema before anything else. Vendors must ensure that Content can be easily exchanged between systems.'

One of the Vendors submitted an important remark that 'MAM projects tend to want to integrate every piece of existing equipment on the site.' This seems a clear warning for Broadcasters not to do so, but it cannot be generalized and other vendors may disagree. However, if a complex integration process is planned, Broadcasters should at least consider splitting it into phases.

Further, the lack of a real HD file format standard for high-end Content was raised.

4.2 Technical questions: strategic

Here, a comparison of all Broadcasters' and all Vendors' responses is first presented in order to identify differences in their strategic approaches to technology.

Integrated file-based facilities

Broadcasters

Top 5 technical strategic questions for Broadcasters

Strategic questions	Scoring
1. How to guarantee a future proof system?	89
2. What are my Vendor's roadmaps for products and support?	82
3. How do I manage risks associated with software upgrades?	79
4. Should I use open, proprietary or standardized formats?	77
5. What hardware migration (e.g. storage technology) should I plan for?	75
6. What should I ask for in service contracts?	61
7. How do I integrate my legacy systems?	57
8. What could / should I outsource?	50
9. Should I regard my system as a service?	43

(Experienced Broadcasters' responses)

Vendors

Top 5 technical strategic questions for Vendors

Strategic questions	Scoring
1. Should I use open, proprietary or standardized formats?	83
What hardware migration (e.g. storage technology) should I plan for?	83

2. How to guarantee a future proof system?	81
3. How do I integrate my legacy systems?	78
4. What are my Vendor's roadmaps for products and support?	72
5. How do I manage risks associated with software upgrades?	69
6. Should I regard my system as a service?	64
7. What should I ask for in service contracts?	56
8. What could / should I outsource?	44

(Vendors' responses)

Partially file-based facilities

Broadcasters

Top 5 technical strategic questions for Broadcasters

Strategic questions	**Scoring**
1. How to guarantee a future proof system?	84
2. How do I integrate my legacy systems?	79
3. What are my Vendor's roadmaps for products and support?	73
4. What hardware migration (e.g. storage technology) should I plan for?	71
How do I manage risks associated with software upgrades?	71
5. Should I use open, proprietary or standardized formats?	64
6. What should I ask for in service contracts?	63
7. Should I regard my system as a service	50
8. What could / should I outsource?	48

(Less-experienced Broadcasters' responses)

It seems that what makes the above rankings different is how the respondents perceive their services.

As Broadcasters manage Content, they focus on:

- using appropriate technology platforms capable to support this activity
  - 'How to guarantee a future proof system?'
- doing it continuously (if needed)
  - 'How do I manage risks associated with software upgrades?'
- being able to prepare for changes
  - 'How do I integrate my legacy systems?'
  - 'What hardware migration (e.g. storage technology) should I plan for?'
  - 'What are my Vendor's roadmaps for products and support?'

Note that the legacy integration question had received more appreciation from Broadcasters in partially file-based facilities.

Vendors tend to follow all of the above concerns though they concentrate more on the aspects directly dealing with technology development:

- 'Should I use open, proprietary or standardized formats?'

The ranking also shows that amongst other options the service-oriented business model is not regarded as a substantial question by most of the responders in all the surveyed groups.

On the other hand, two of the Vendors specifically addressed the outsourcing question:

- 'Key issues tend to be build or outsource. If build then how to maintain a system capable of upgrade with an IT platform that has a lifecycle of 3 to 5 years.'
- 'Some customer outsource their archive, also some customers offer a managed off-site service.'

4.3 Technical questions: preparation

Preparation - general

In general, preparation activities for archive integration deal with overall changes towards file-based technology and workflows. This means equipment upgrades, new developments and changes in organization processes.

The following preparatory activities for archive integration in their respective production areas were also flagged by Broadcasters:

- **Acquisition**
  - Content format conversion capability, with regard to the Essence and container (e.g. 'MXF rewrapping')
- **Ingest**
  - Metadata flow/mapping – e.g. by 'Metadata integration via ESB (Enterprise Service Bus)'
- **Play-out**
  - Needs to increase servers capacity, if an archive for HD Content is integrated
- **Newsroom system**
  - Ability to interface with future DAM (Digital Asset Management) system
  - Metadata flow/mapping – e.g. by 'Metadata integration via ESB (Enterprise Service Bus)'
- **Usage rights**
  - Ability to interface with future DAM system
  - 'New conventions/rules of filling in the usage rights'.
- **Archives themselves**
  - Needs to prepare for HD and review back-up system and maintenance
  - Interface with a legacy archive system
  - Creating Metadata conversion rules, cleaning-up the existing Metadata, creating new data model for the MMS (Media Management System)

Summarizing the foregoing, one can notice the importance of the following preparation activities:

- Plan which production areas need interfacing for media and Metadata flows
- Asses format conversions needs
- Plan Metadata mapping and conversion rules
- Plan internal Metadata scheme for archive database
- Use structural Metadata, including license/personal/usage rights Metadata
- Clean up Metadata in any existing legacy database
- Plan storage (and bandwidth) capacity of all links within the production chain

Preparation – IT infrastructure

Integrated file-based facilities

Broadcasters

More then half the Broadcasters (53%) reported that they had increased their network performance in order to make their IT infrastructure ready for digital archive deployment (and integration). One of the respondents decided to create a 'different 'Archive' network connected to editing systems

with gateways to the office network.'

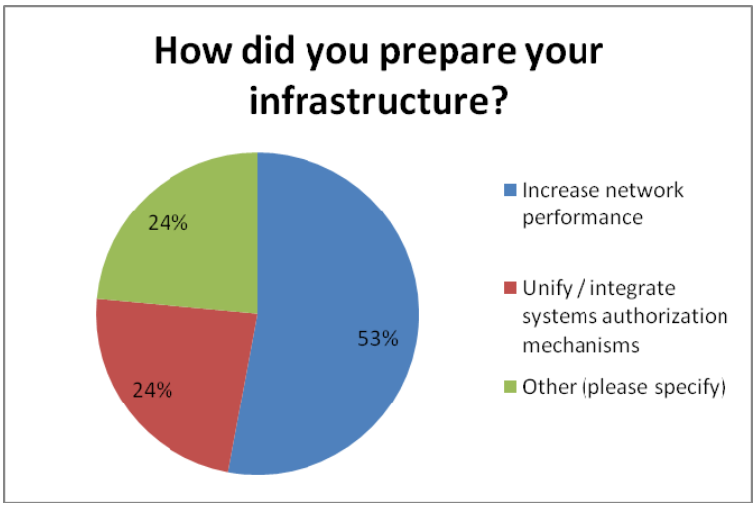


Figure 13: (Experienced Broadcasters' responses)

Unification/integration of authorization systems during the preparation phase was reported by almost 25% of Broadcasters.

Vendors

Both factors - network performance and unification/integration of authorization were equally recognized by 36% of the Vendors. With regard to planning the network, the importance of cooperation with well-skilled network designers was stressed. Also, a possibility of implementing network acceleration tools to transfer large files faster was mentioned.

Other activities include:

- Dimensioning the storage

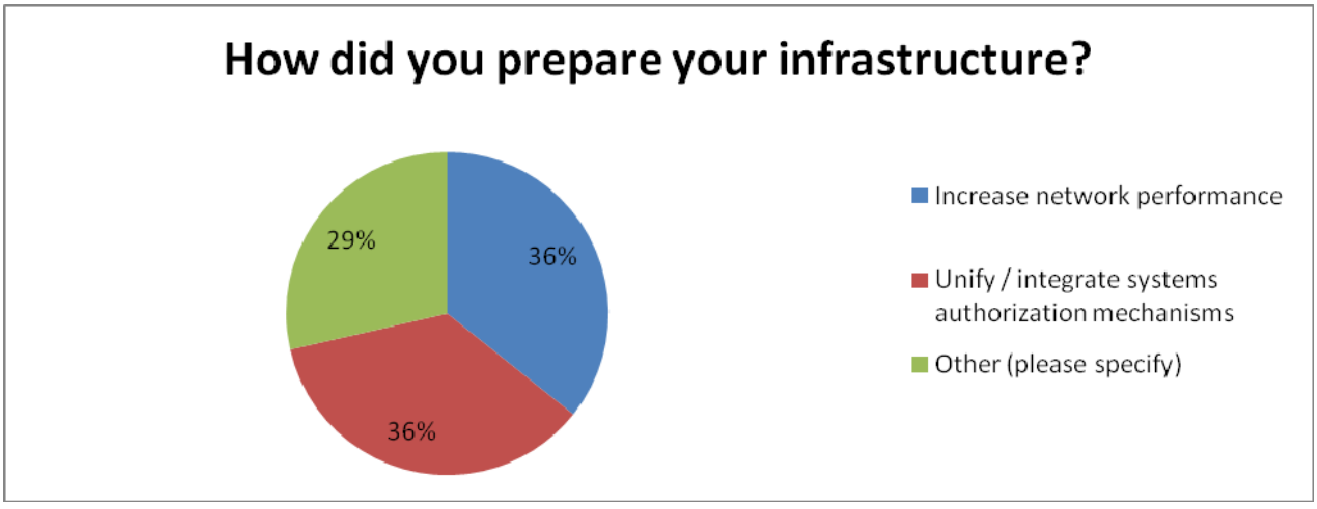


Figure 14: (Vendors' responses)

Preparation – other activities

Integrated file-based facilities

Broadcasters

A case of using 'Infiniband' technology for easy and faster access was mentioned.

This reminds us that apart from sheer network infrastructure, one should also include storage, server and end-user devices characteristics in the overall bandwidth calculation to guarantee an

undisturbed Content flow.

Vendors

One of the Vendors emphasized that MAM systems should precede other implementations: 'Without MAM, material is not going to be referenced properly and media is going to lose its value.'

Workflow-wise, the archive/retrieve processes need to be an integral part of the operational chain. 'A common storage strategy can support the archive roll out.'

4.4 Technical questions: level of integration

Integrated file-based facilities

Broadcasters

The following chart presents the different levels of archive integration reported by Broadcasters.

These levels should be understood as follows:

- Essence flow - e.g. auto transcode engine farm, streaming server control
- Essence and Metadata flow - e.g. Essence flow and information notification scheme, version control status flagging
- Integrated items flow - associated time-locked media, text, graphics and other – e.g. in an edit project structure, news item structure, etc.
- Common Content information for all media – a system that 'knows everything', similar to a library
- Common Content management for all media - a system that 'knows and does everything', library alike plus Essence flow control
- Common workflow management - library plus Essence flow control plus business process workflow control

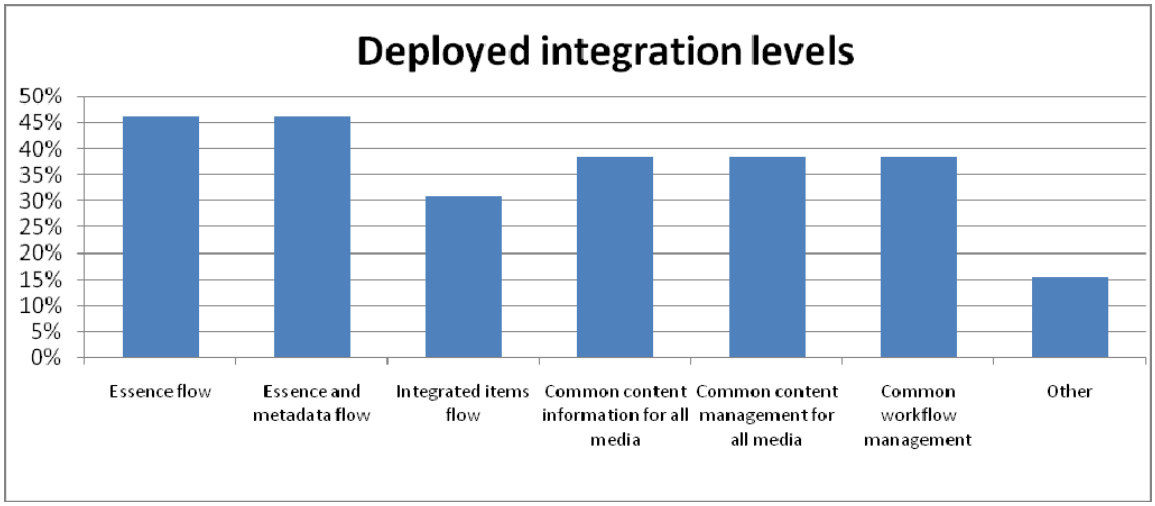


Figure 15: (Experienced Broadcasters' responses)

Broadcasters indicated basic integration levels – Essence flow and Essence/Metadata flow as two of the most popular implementations. Common Integrated items flow is either least implemented or the least recognizable level.

Other reported levels (not included in the chart) include common Content management systems with limited capabilities, e.g.:

- Limited scope of production areas
- No history tracking

- No genealogy tracking

Partially file-based facilities

Broadcasters

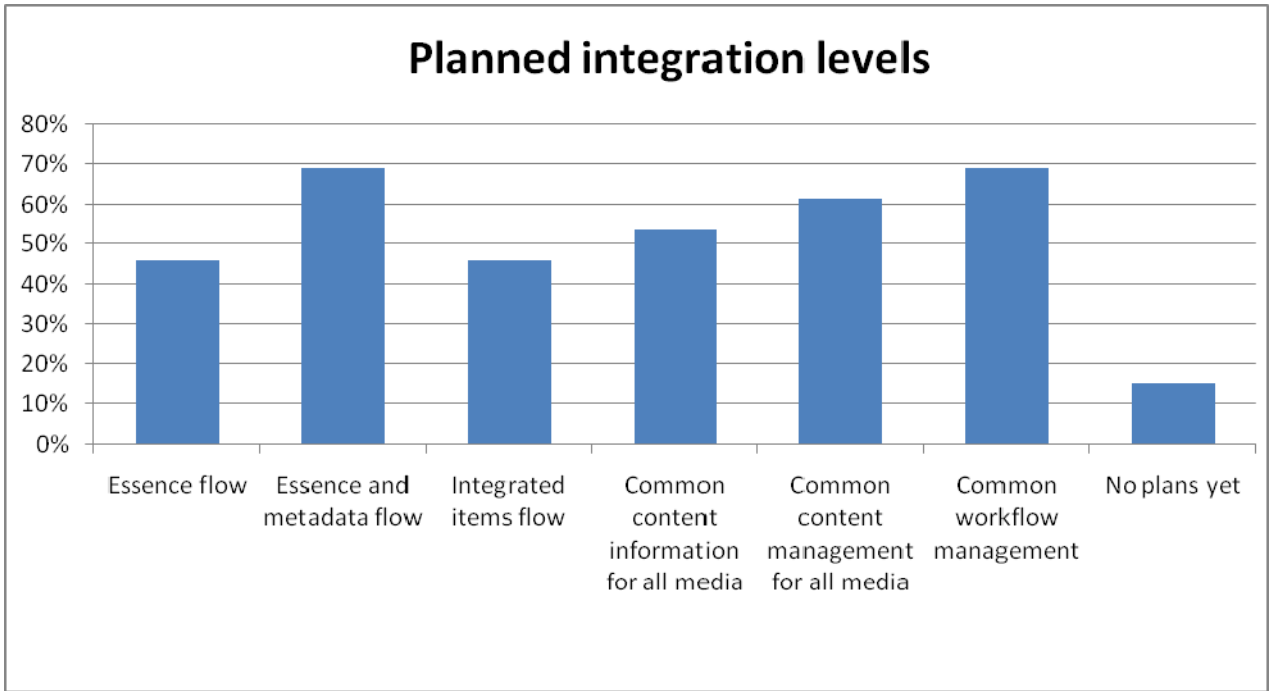


Figure 16: (Less-experienced Broadcasters' responses)

Again, a basic integration level scored high, with an emphasis on Metadata. However considerable expectations towards more sophisticated levels can also be observed. The expectations scored much higher here then the implementations.

Vendors

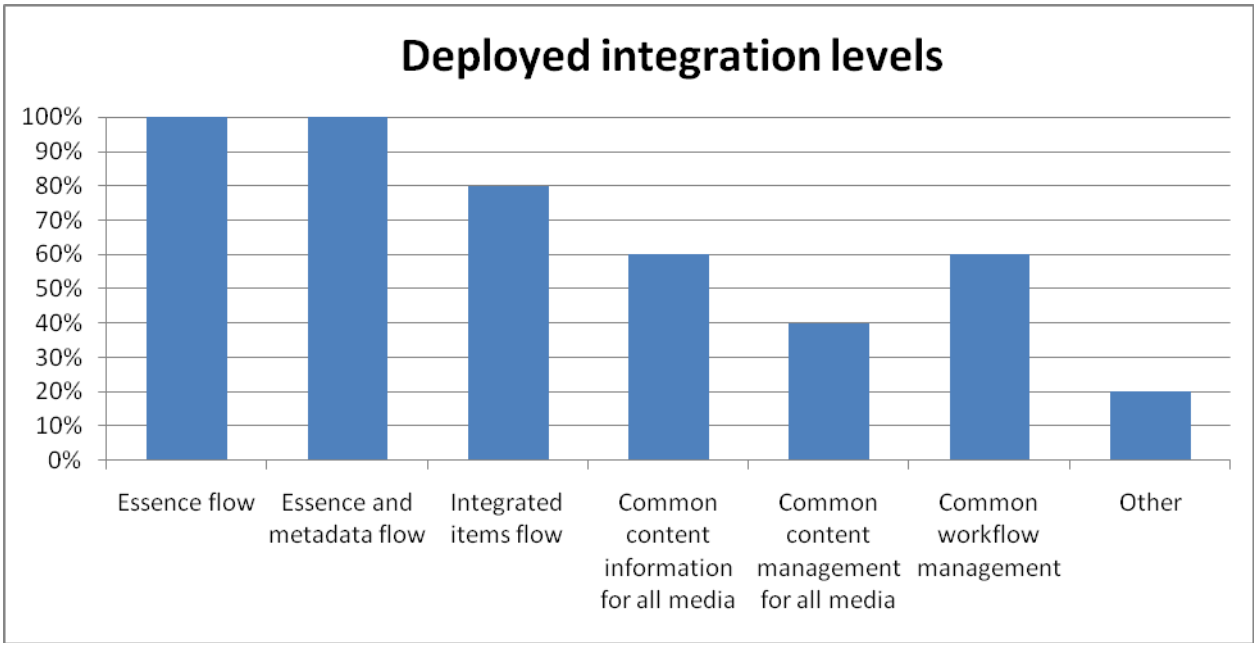


Figure 17: (Vendors' responses)

The results indicated by Vendors are the most 'conservative' in terms of observed integration advances. The higher the integration level, the lower is the number of implementations. A slight departure from this is a workflow management level; however this result needs to be treated with

caution. Here, one has to examine every case, differentiating a workflow engine implementation from a full workflow management implementation using a given engine technology.

Also again, according to the Vendors' responses, a phased approach in integrating limited organizational scopes seems a factor deserving great attention, as it allows to 'focus on individual domains [News, Production, Transmission etc.] to minimize investment and maximize the chances of return on investment (ROI). Big Bangs tend to fail to deliver due to technical and operational complexity. And people.'

4.5 Technical questions: Essence formats

4.5.1 Video formats (Image Sampling Systems)

Integrated file-based facilities

Broadcasters

The following video formats (Image Sampling Systems) were reported by Broadcasters as being used for the archived Essence:

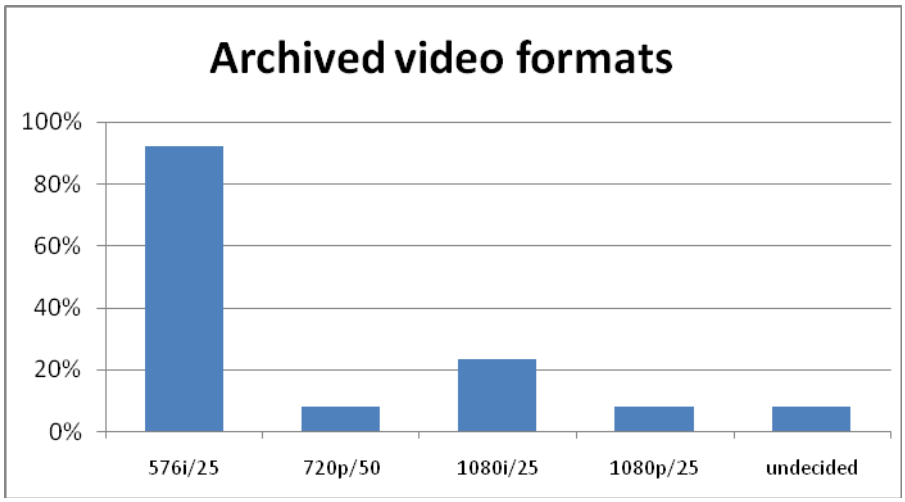


Figure 18: (Experienced Broadcasters' responses)

Most of the Content is archived as a standard definition interlaced format. If a HD format is used an interlaced format is still most common. Judging from the results one has to take into account the correlation between archive format and production format, which is covered below.

Vendors

Vendors report a standard definition interlaced format as the most popular archive format. The 720p and 1080i formats take the lead in the HD domain.

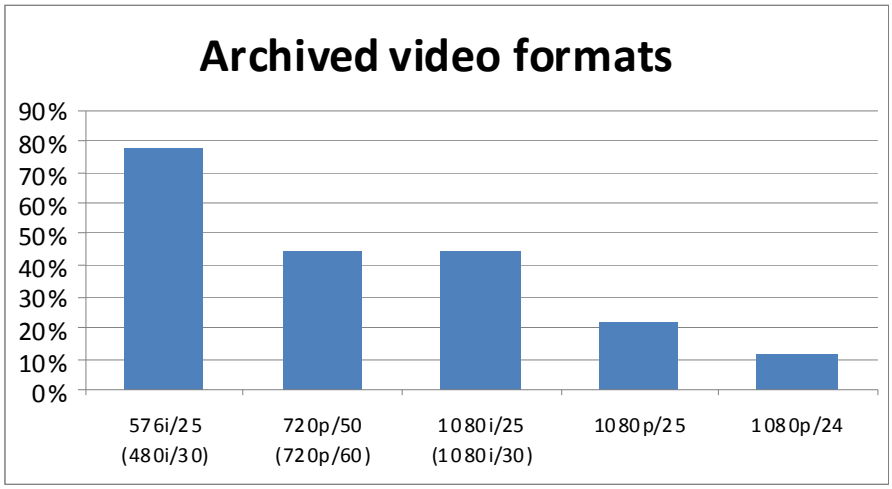


Figure 19: (Vendors' responses)

Partially file-based facilities

Broadcasters

Broadcasters having partially file-based facilities indicate interlaced formats as mostly used or considered for use in their archives, both in the SD and HD domains. A considerable number of 'undecided' can be observed here.

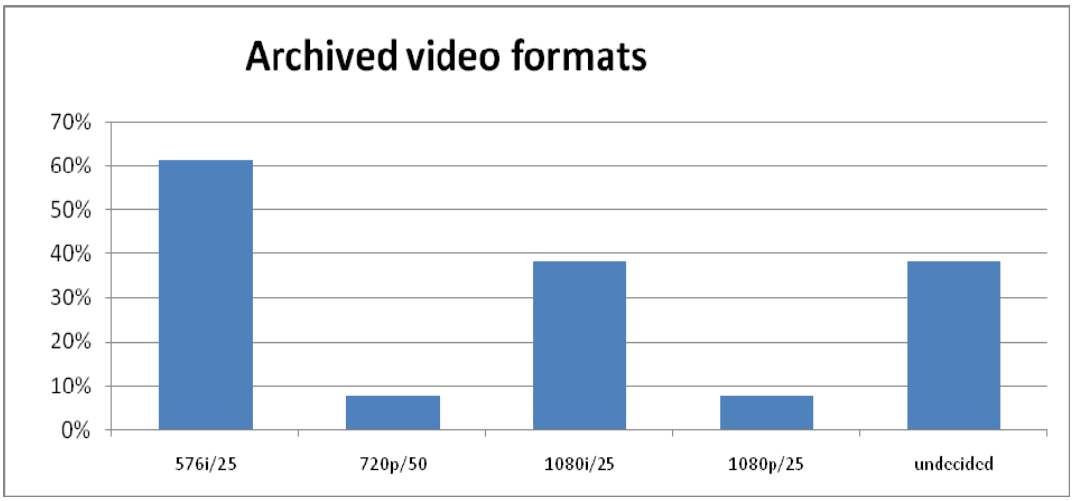


Figure 20: (Less-experienced Broadcasters' responses)

4.5.2 Compression formats

Integrated file-based facilities

Broadcasters

Most Broadcasters report the use of intra-frame compression for standard definition material. Some MPEG-2 long GOP, AVC-Intra and VC-3 (DNxHD) use was indicated with regard to HD.

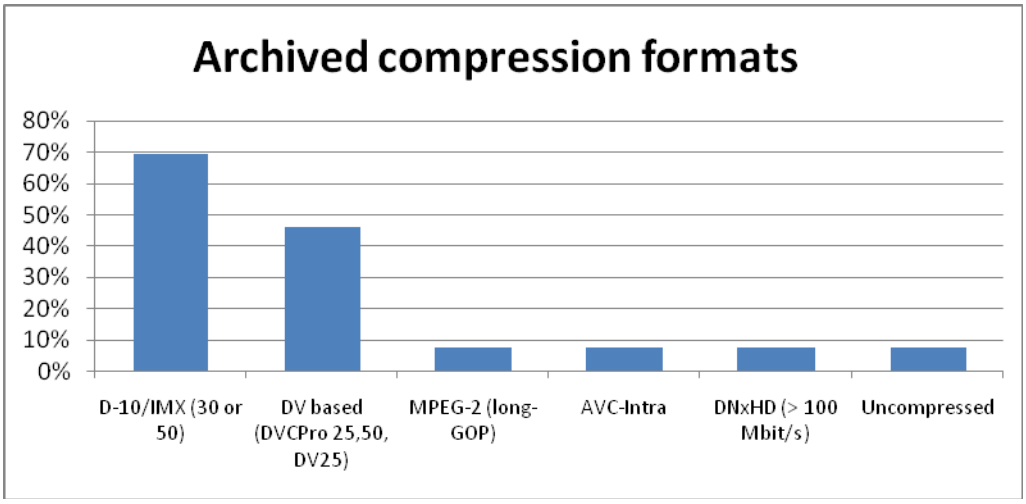


Figure 21: (Experienced Broadcasters' responses)

Vendors

Vendors tended to be concerned more with HD material archiving, where additionally the JPEG2000 compression format was mentioned.

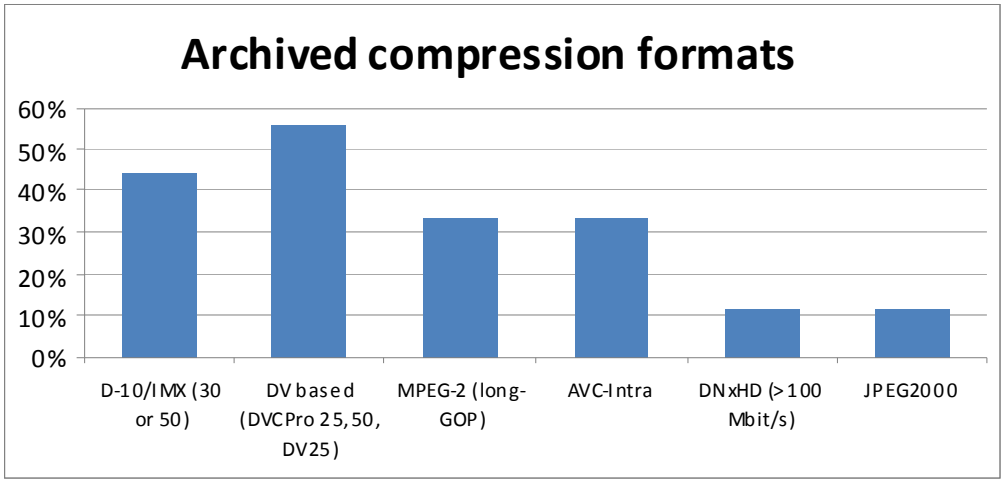


Figure 22: (Vendors' responses)

Partially file-based facilities

Broadcasters

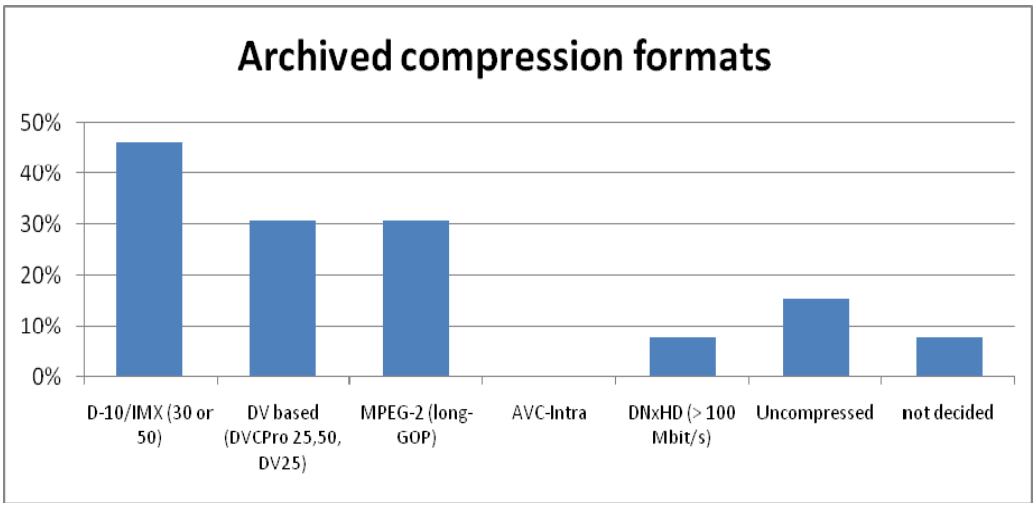


Figure 23: (Less-experienced Broadcasters' responses)

Almost half the Broadcasters having partially file-based facilities specified an IMX compression format in the SD domain. Compared to broadcasters in fully file-based environments, more use is made of MPEG-2 (long GOP) compression format.

4.5.3 Wrappers/file formats

Integrated file-based facilities

Broadcasters

The survey results show that 75% of Broadcasters specify MXF as a wrapper format for the archived Essence. Also, QuickTime and AAF containers were mentioned, one of the respondents reported QuickTime as a format was determined by technology already in use (no option to use MXF at the moment).

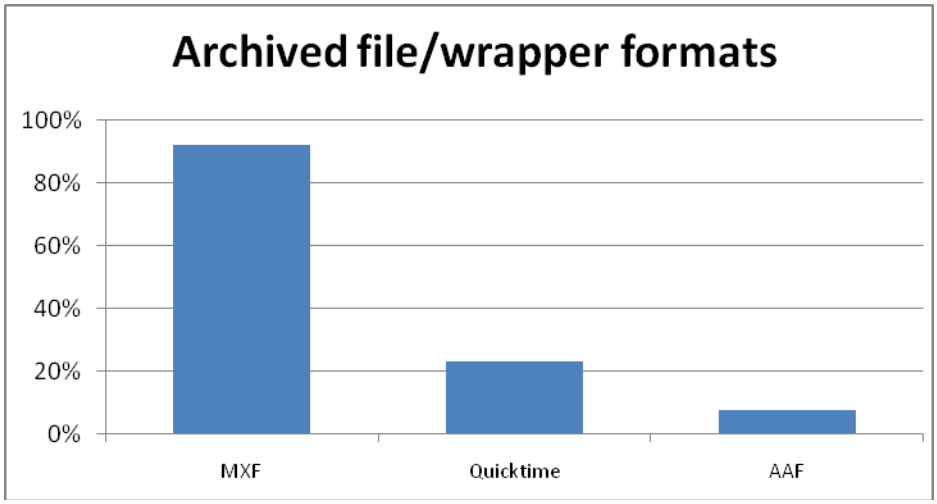


Figure 24: (Experienced Broadcasters' responses)

Vendors

Vendors, similarly to Broadcasters, recognize MXF wrapper as a main container format for the archived Essence. On the other hand, they provide a great number of other formats to choose, probably trying to be as flexible with customer's needs /constraints as possible.

Other than MXF, the following formats were mentioned:

- QuickTime
- AAF
- GXF
- RAW
- AVI
- MPEG (1&2)

Other wrapper formats mentioned by individual Vendors: DV DIF streams, DPX, VOB, MP4, WMA, and SWT.

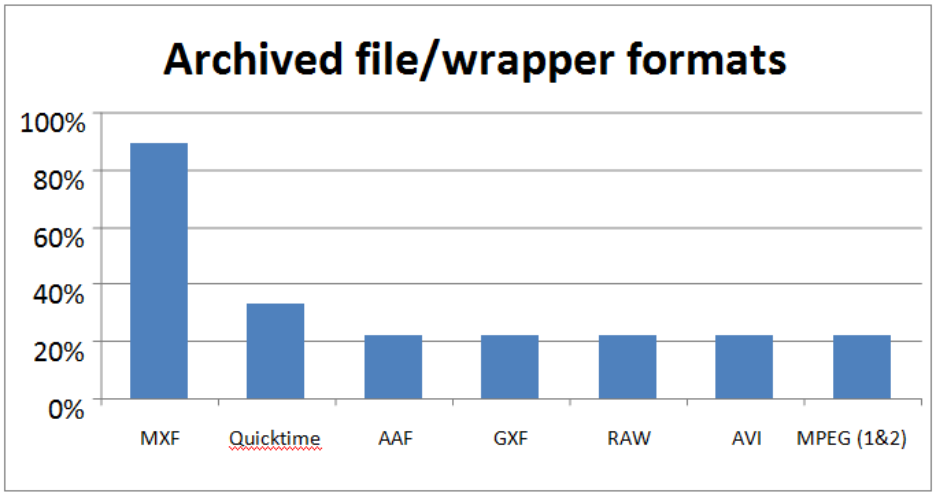


Figure 25: (Vendors' responses)

Partially file-based facilities

In general, Broadcasters with partially file-based facilities specify MXF as a main wrapper. In addition, an MPEG stream format was mentioned. There are also a small percentage of 'undecided' Broadcasters.

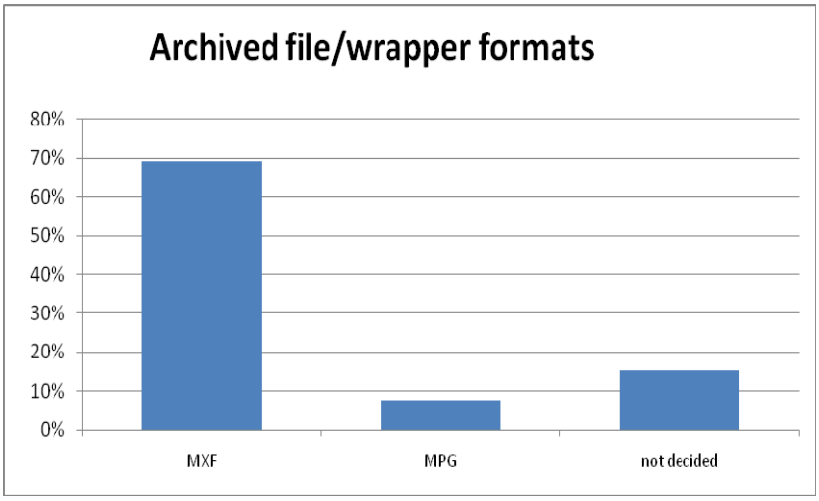


Figure 26: (Less-experienced Broadcasters' responses)

4.5.4 Media formats

Integrated file-based facilities

Broadcasters

Data Tape (mainly LTO3/LTO4) is used as a main high capacity media format for the archived Essence. Video tapes are commonly maintained as a backup. HDD based systems usually serve as a temporary / cache (online or near line) storage.

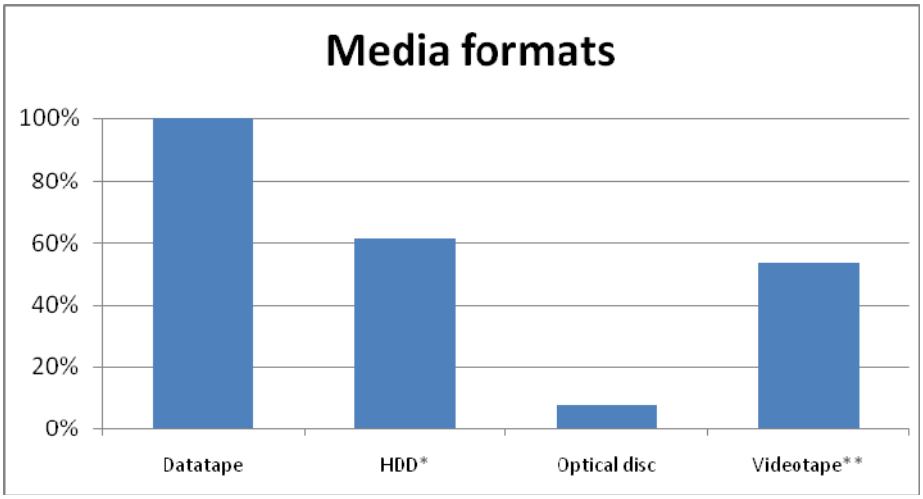


Figure 27: (Experienced Broadcasters' responses)

Vendors

Here, a clear example of the 'support all' approach was revealed.

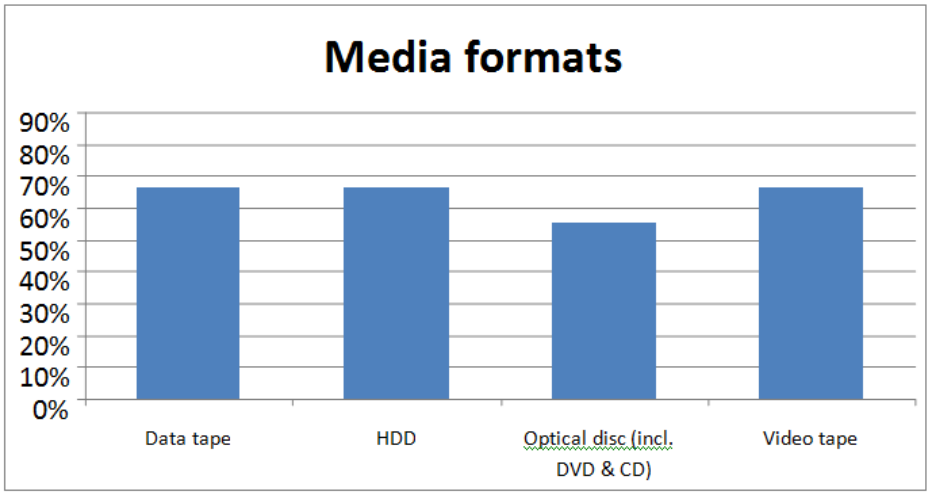


Figure 28: (Vendors' responses)

Partially file-based facilities

Broadcasters

The results are similar to those obtained for integrated file-based environments.

A common basis for these options is a mixed environment, where a deep, data-tape based archive is supported with HDD storage for faster access and with master video tapes for redundancy. As video tape backup is commonly used for Content originally created on video tape, it may not however be relevant for Content originally created in the file domain.

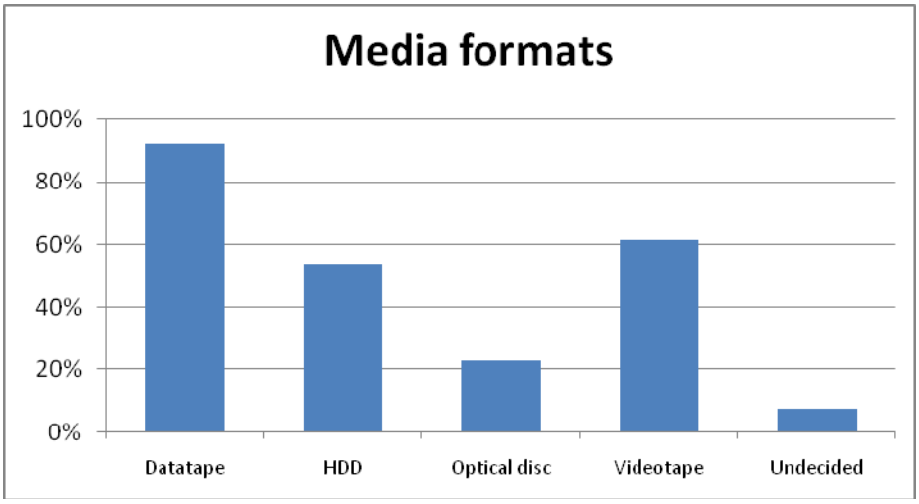


Figure 29: (Less-experienced Broadcasters' responses)

4.5.5 Media transport mechanism

Integrated file-based facilities

Broadcasters

The following media transport mechanisms (protocols, technologies) were indicated (listed in the order in which they were most mentioned):

Media transport in communication layers				
	Physical	**Network**	**Transport**	**Application**
1	Ethernet	IP	TCP	FTP
2	Fibre Channel		UDP	HTTP, CIFS
3				MPLS
4				RTP

Vendors

Vendors, additionally to Broadcasters, already observe SOAP in an application layer.

However, what really stands out in Vendors' results is an awareness of the HTTPS and SFTP secure transport protocols.

Media transport in communication layers				
	Physical	**Network**	**Transport**	**Application**
1	Ethernet	IP	TCP	FTP, HTTP(S)
2	Fibre Channel		UDP	SOAP
3				NFS
4				SFTP, CIFS

4.5.6 Browsing formats

Integrated file-based facilities

Broadcasters

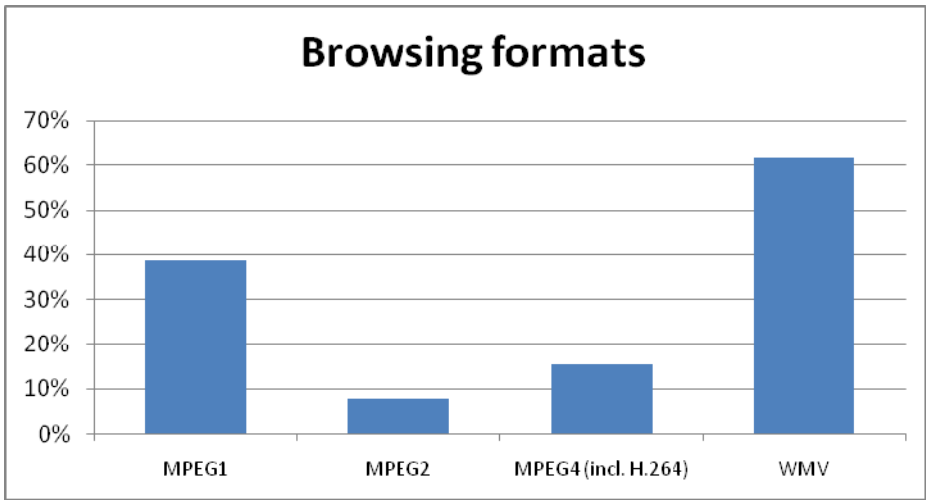


Figure 30: (Experienced Broadcaster' responses)

The most common browsing formats put in practice in integrated file-based archives are:

- WMV - proprietary manufacturer Windows Media format
- MPEG-1, usually deployed in SD environments

Vendors

Description - see the next section.

Partially file-based facilities

Interestingly, both Vendors and Broadcasters in partially file-based facilities report MPEG-4/ .264 as a main browsing format with a rather low use of WMV, which is in a contradiction to the results of Broadcasters with fully integrated file-based systems.

Here one should take into account that H.264 was not available in the past. However, the increased efficiency (lower data rate for equal picture quality compared to legacy formats) of H.264 seems to be very attractive for new investors.

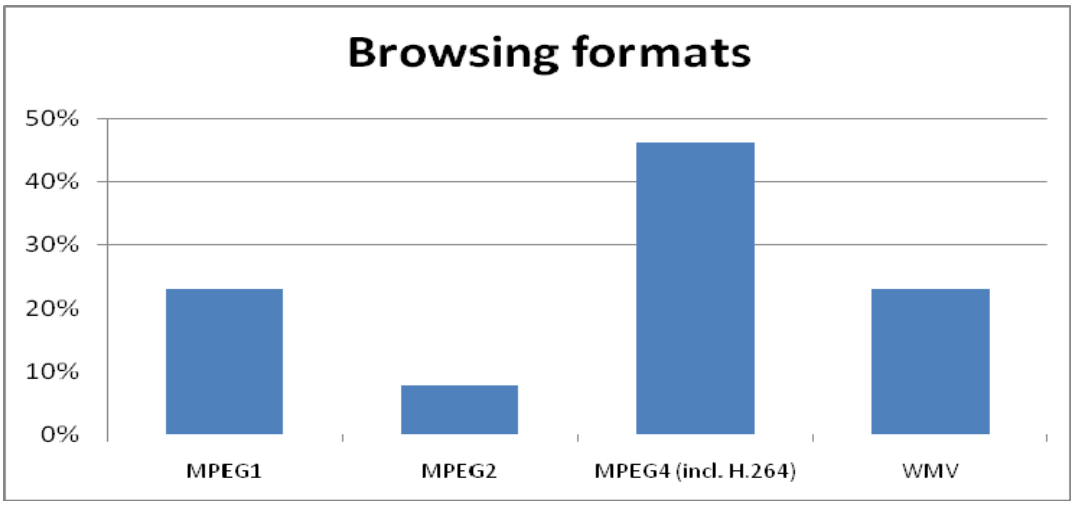


Figure 31: (Less-experienced Broadcasters' responses)

4.5.7 Number of file formats in production & archive

Integrated file-based facilities

Broadcasters

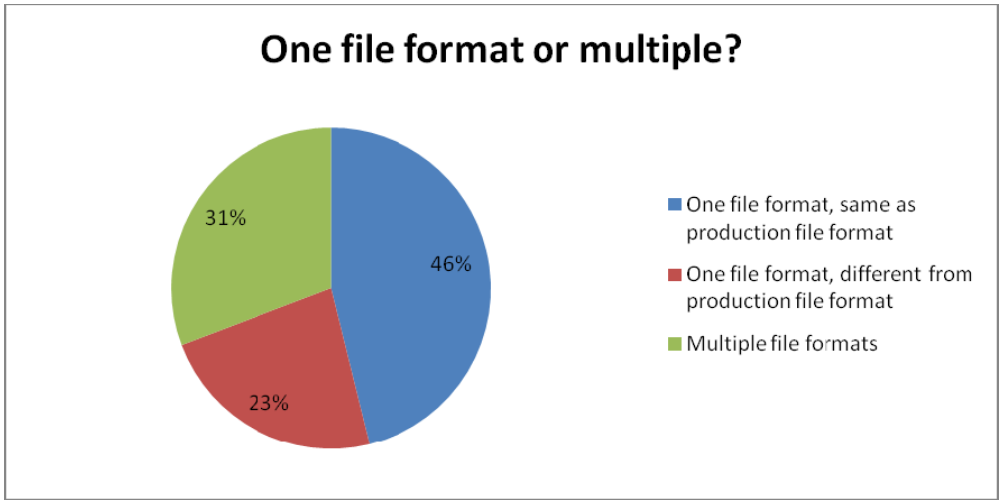


Figure 32: (Experienced Broadcasters' responses)

One of the most common questions Broadcasters ask before digital archive implementation deals with the best Essence format for their archived Content.

Here, three options were given:

- Archived Content is kept in one file format – same as production format (option 1)
- Archived Content is kept in one file format – different from production format (option 2)
- Archive Content is kept in multiple (usually source native) formats (option 3)

Broadcasters in integrated file-based facilities reported option 1 as a most common case, and option 2 least common, but still used.

The reasons indicated for keeping Content in one (production) format are as follows:

- Less time to restore – no time needed to convert the Essence
- No problems with transcode quality issues
- General workflow simplicity, as far as one format is used overall in the production chain

One of the Broadcasters mentioned that ideally they would 'archive in the native format and transcode when needed', but currently they don't do this by reason of the first two issues mentioned above.

It was also reported that in one facility a common MXF wrapper is used, but compression formats vary.

Vendors

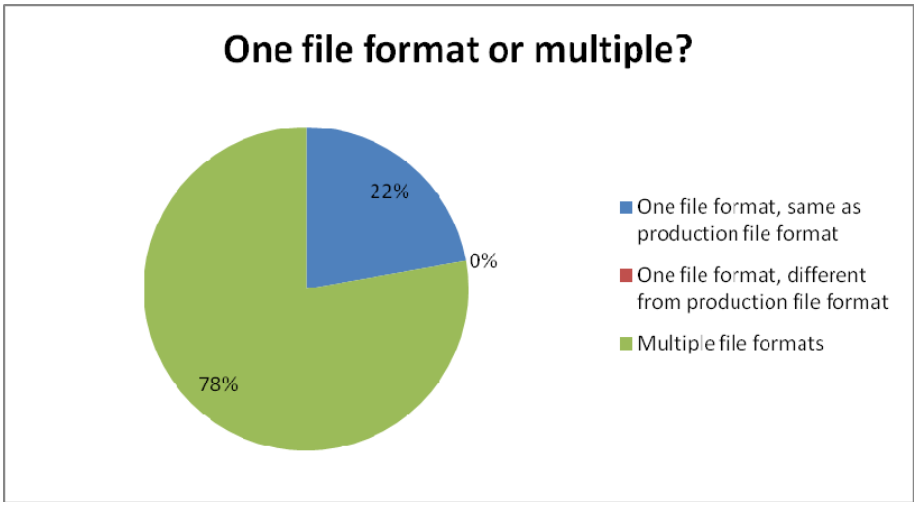


Figure 33: (Vendors' responses)

Vendors clearly favour a multiple formats option (over 75% of the responses).

The reasons given are:

- Preserving original quality / minimizing generation quality loss
- Too many operational constraints in a production infrastructure and workflow with regard to one file format
- Too many source and output formats to handle in a 'one format' environment

It seems that Vendors tend to look at the production environment as a mixture of different independent technologies, where an effort to convert the Essence in order to keep Content in one file format would outgrow resources needed to handle multiple file formats.

However, one of the Vendors mentioned a compromise situation, where two or three base Essence formats were chosen.

Partially file-based facilities

Broadcasters

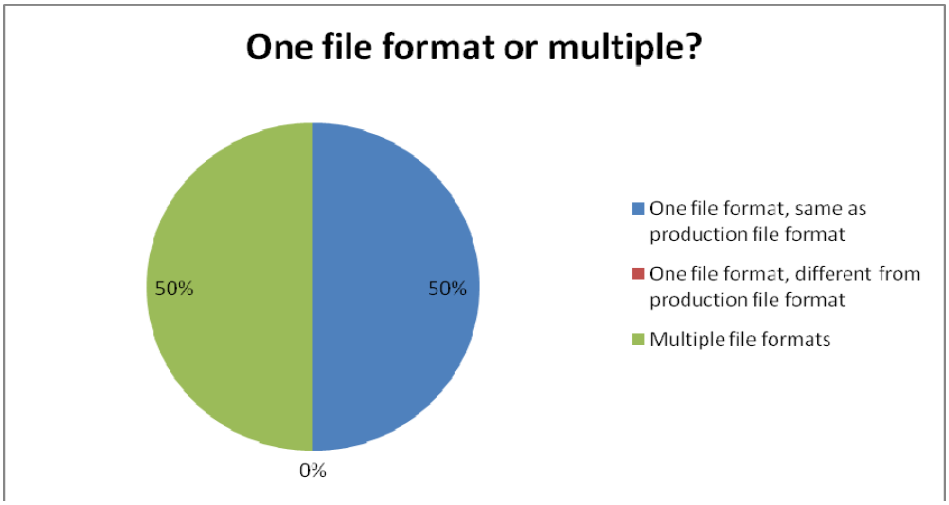


Figure 33: (Less-experienced Broadcasters' responses)

Broadcasters in partially file-based facilities were split equally between those voting for one and the same archive and production file format and those voting for multiple file formats.

The supporters of one file format in a whole production chain (including archive) use the following

arguments:

- Faster access to the Content (no need to wait for transcoding)
- In fact – this is an implementation of 'keep in a native format' idea, minimizing the generation loss
- Easy implementation of the archive and media management

Those, who represent a multiple file formats approach, indicate the following:

- Quality is the priority – keep native or uncompressed
- Too many source / output formats – too much effort to handle the conversions. Sometimes, they might not even be needed if there is a clear division between deliverers / receivers of a given format (e.g. format A is delivered/received only by entity 1, format B is received only by entity 1 etc.) – so, if the given format is not shared among different groups of users.
- Formats (different) are determined by the hardware used, which renders a one file format discipline too difficult to handle.

4.5.8 Storing 'Video Edit Projects'

Integrated file-based facilities

Broadcasters

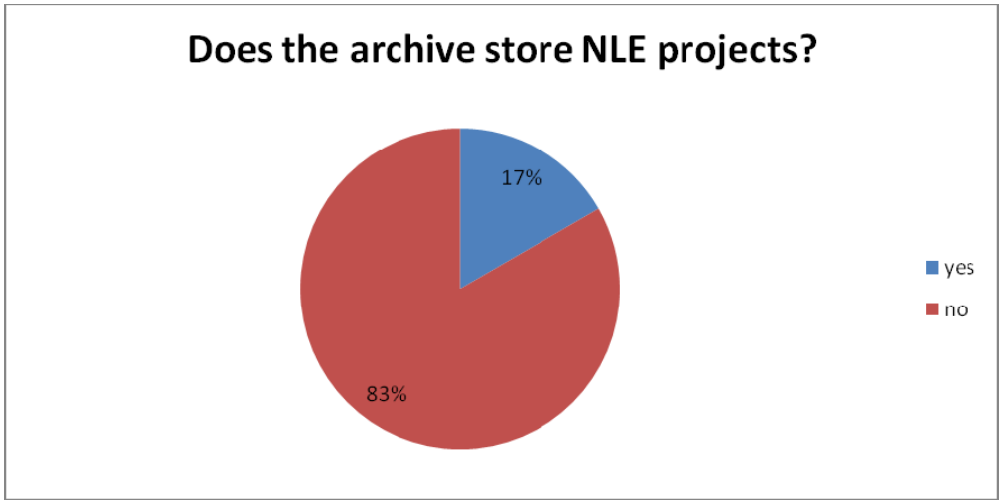


Figure 34: (Experienced Broadcasters' responses)

Most Broadcasters having integrated file-based facilities report not to keep NLE projects in their archives. This is usually determined by the decision to keep only finished Content or due to technology limitations, especially if different systems are used to manage the archive and the production Content (integration functionality limitations).

The option of keeping NLE projects in the archive over a certain limited time period (several months) was also mentioned.

Vendors

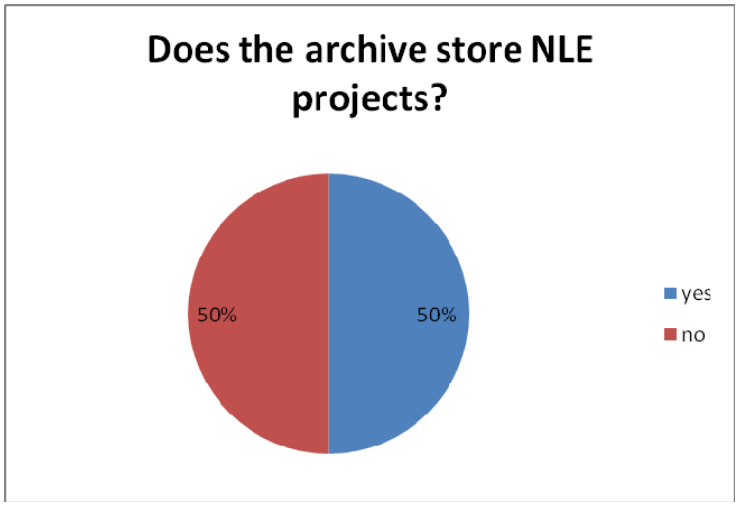


Figure 35: (Vendors' responses)

Vendors report that they use systems that do implement and those that do not implement NLE projects storage in the archive equally. Whether the system used does implement the feature or not depends on users' requirements and the exiting systems interfaces used in the production chain. Some of the Vendors admit that it still needs some technology progress and that the work is currently being advanced.

Partially file-based facilities

Broadcasters

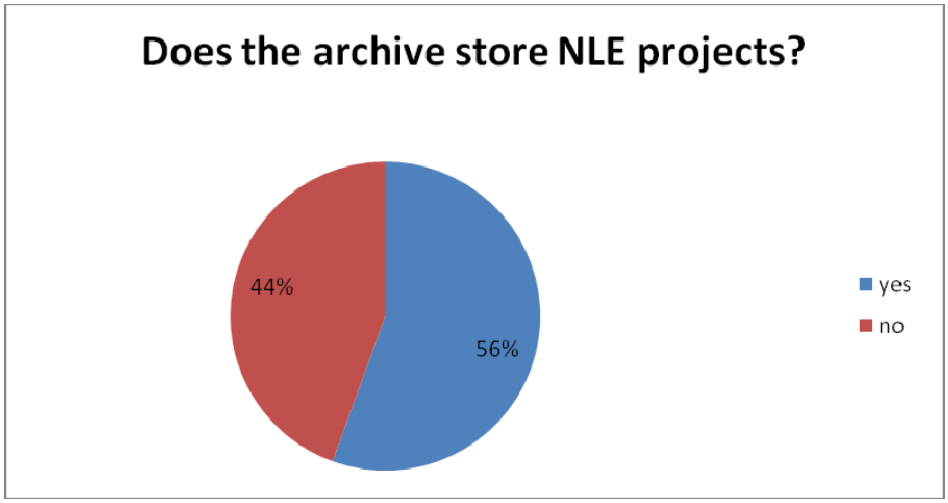


Figure 36: (Less-experienced Broadcasters' responses)

Most Broadcasters having partially file-based facilities regard storing NLE projects in their archive as an important feature, even if the projects are kept there only for a few months (e.g. dubbing projects).

There is the expectation that a 'MAM system is supposed to allow archiving any kind of document', but this expectation is probably with a limited awareness of the integration needed and the constraints posed by existing technologies.

4.5.9 Different HD formats for different purposes in the archive?

Integrated file-based facilities

Broadcasters

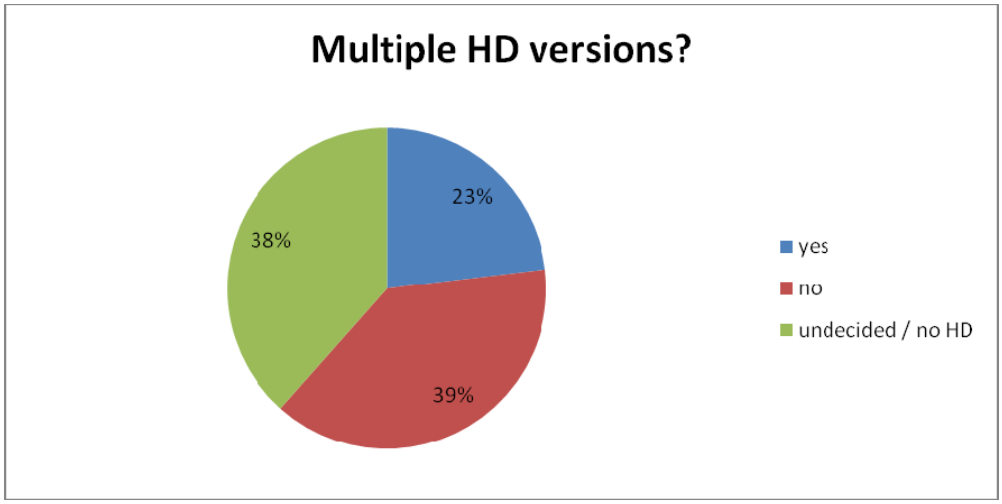


Figure 37: (Experienced Broadcasters' responses)

The majority of Broadcasters already using HD Content tend to specify a single HD archive format, though the same constraints apply here as mentioned in §4.5.7.

The results and comments clearly show that there is a general expectation among Broadcasters that guidance will be provided by standardizing bodies, which would allow them to undertake a proper strategy.

Vendors

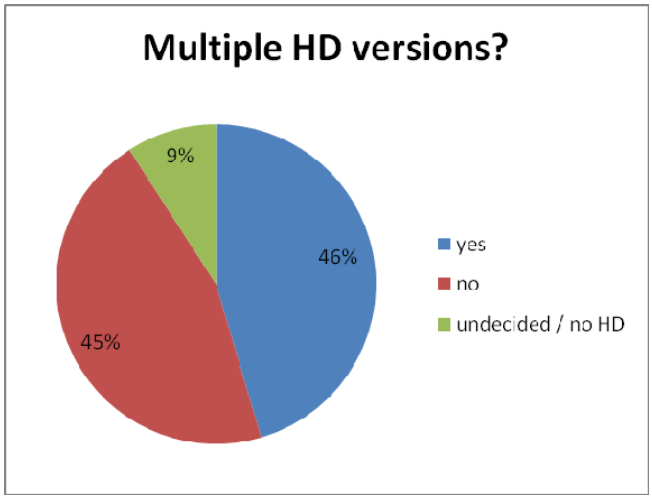


Figure 38: (Vendors' responses)

Vendors indicate no clear winner here. The following reasons to keep multiple formats were given:

- Keep native
- Different sources and outputs – powerful resources needed to convert
- Capacity and bandwidth constraints - adjust the compression factor to the needs, e.g.
  - 50 Mbit/s – News
  - 120 Mbit/s – production
  - 400 Mbit/s – high end production

Partially file-based facilities

Broadcasters

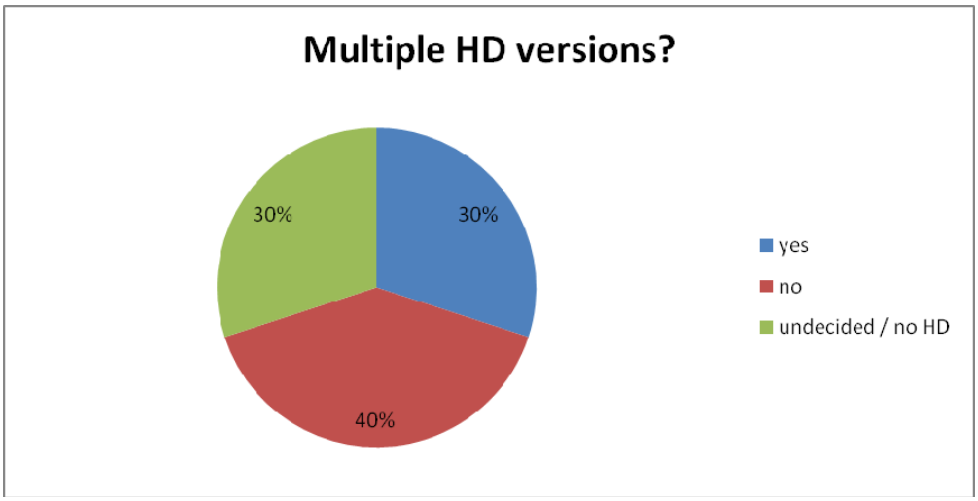


Figure 39: (Partially file-based Broadcasters' responses)

Broadcasters with partially file-based facilities represent similar concerns as other surveyed groups.

In general, summarizing results in this section:

- Firstly, there is an expectation to have no technology constraints of being forced to convert from one manufacture-native format to another. There is a great opportunity for standardization bodies to provide support here.
- Secondly – Broadcasters are faced with many technology and workflows question, which usually come down to finding the best balance between:
  - quality of the Content and time to deliver the Content
  - both above / technology costs

4.6 Technical questions: Metadata (flow)

4.6.1 Metadata in business to business (B2B) Content exchange

Broadcasters were asked what B2B exchanges they had been unable to perform due to Metadata issues, if any.

Most Broadcasters reported that they had experienced no issues concerning this matter. One specific problem was indicated, where the on-line searching capability to find and preview Content was not possible. On the other hand, rights management is expected to be a problem.

4.6.2 Metadata standards for exchange between archive and production

Integrated file-based facilities

Broadcasters

Almost 20% of Broadcasters reported their use of Dublin Core based standards for Metadata exchange between archive and production. The next largest group (13%) declared their use of their own internal Metadata scheme.

The remaining, individual responses include:

- P/META based schemes,
- ISAD (G) - International Standard Archival Description (General).

Vendors

The majority of Vendors (56%) tend to approach Metadata exchange schemes as a user requirement or as a customer-dependent proprietary format. Simply put, they expect to be confronted with the implementation of a 'non-standardized' scheme.

Single responses indicated usage of DMS-1 and Dublin Core based formats.

Partially file-based facilities

Broadcasters

Broadcasters with partially file-based facilities either specify their own in-house formats (most popular) or use a Dublin Core based or P/META based Metadata scheme for exchange.

4.6.3 Metadata standards for internal archive usage

Integrated file-based facilities

Broadcasters

Broadcasters with integrated file-based facilities indicate the use within their archives of mainly their own proprietary (25%) or Dublin Core based (13 %) formats. Interestingly the results for these two format groups exhibits almost the reverse order compared to the results for Metadata exchange formats.

Remaining, individual responses reported the use of P/META based, ISAD (G) or other formats.

Vendors

With their results Vendors again confirmed their user-requirements oriented approach, much as in §4.6.2.

Partially file-based facilities

Broadcasters

Broadcasters with partially file-based facilities reported similar results to those for the exchange between production and archive. However, this could also be interpreted that they will use the same standards for Metadata exchange between systems and for internal archive use, which is in contradiction with those Broadcasters that already have a fully integrated file-based environment.

In general, the following tendencies can be observed with regard to Metadata technology:

- In-house developed (proprietary) and Dublin Core based formats are the two most common Broadcasters' choices in the archive environment.
- In-house formats are more frequently specified for internal archive usage, whereas Dublin Core based formats serve mainly for Metadata exchange between archive and production (maybe a variety of different systems).
- Vendors very rarely bring Metadata format proposals to customer, rather willing to depend on clients' specific requirements or developed in-house formats.
- Broadcasters that still do not have fully file-based facilities are somewhat optimistic about the usage of the same given Metadata standard in different areas concerned. However they might be forced to change their initial thinking if it comes to real implementations that fits all requirements and needs within their facilities.

4.7 Technical questions: storage technology

4.7.1 Storage media and technologies used for long term storage

Integrated file-based facilities

Broadcasters

Broadcasters with integrated file-based facilities clearly indicated data-tape based system (LTO/DLT) as a technology mostly used for long term storage. Other options include:

- Hard disk based systems
- Media tape/disk robots
- Media tape on shelves
- Other data-tape based system (non LTO/DLT)

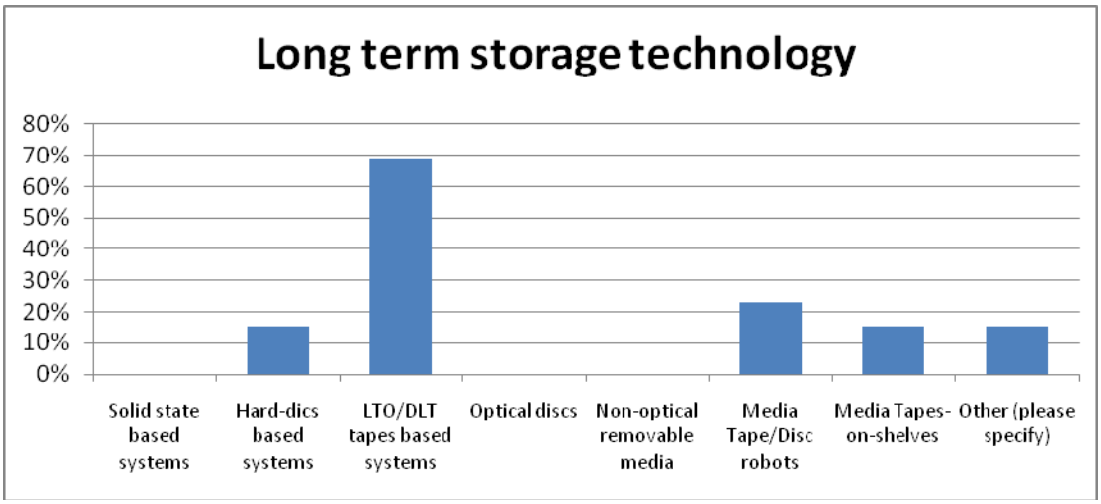


Figure 40: (Experienced Broadcasters' responses)

Vendors

Depending on the Vendor's business profile, their responses varied from 'support all' to a 'transparent' attitude.

In the first case Vendors declare to be able to manage a wide range of available storage devices, even wider then mentioned in this survey. On the other hand, some of the Vendors (e.g. MAM Vendors) do not consider the storage media itself, but rather determine only the file infrastructure, e.g. protocols/interfaces such as CIFS, FTP, and NFS etc.

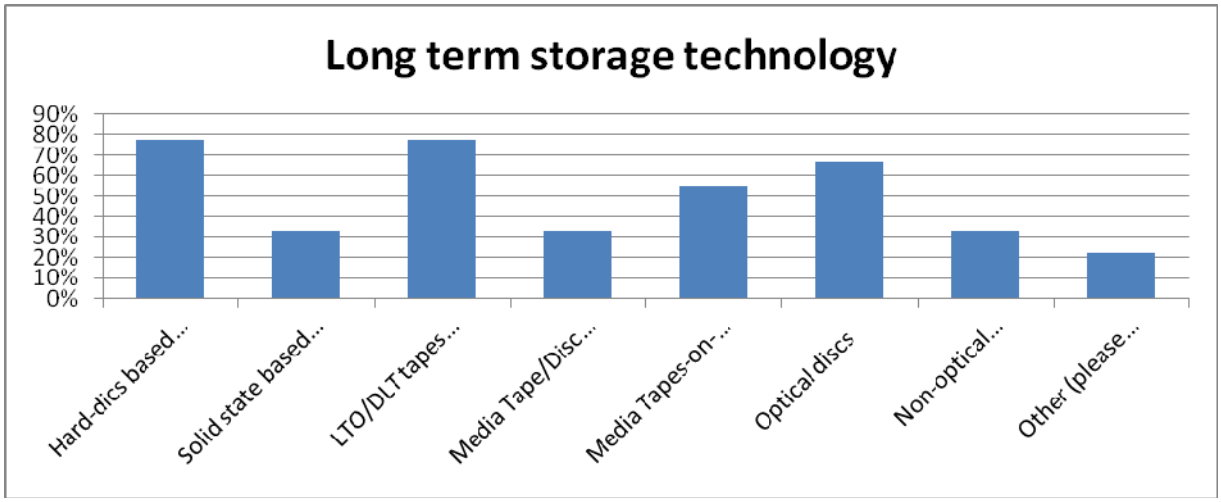


Figure 41: (Vendors' responses)

Compared with Broadcasters, more usage of/ability to use hard disk based systems and optical disks was reported. This is probably due to the Vendors work with a lot of 'smaller' Content holders (e.g. post production houses) which largely work on disk storage systems that Broadcasters with large archives cannot afford.

Partially file-based facilities

Broadcasters

Broadcasters with partially file-based facilities expect to use mainly LTO/DLT tape-based systems, although other options are also mentioned, such as:

- Hard disk based systems
- Media tape/disk robots
- Media tapes on shelves
- Optical disks

and finally

- Solid state based systems

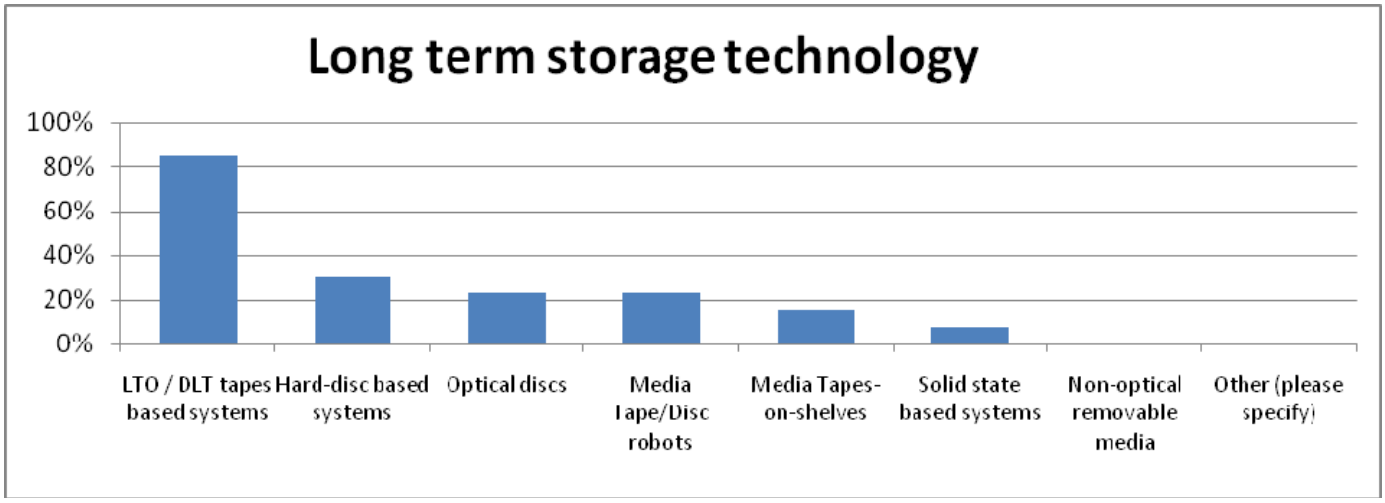


Figure 42: (Less-experienced Broadcasters' responses)

Some statements concerning the capacity needed indicate a requirement to accommodate hundreds of thousands of hours of existing Content and tens of thousands of hours of increase per year.

4.7.2 Integrating storage technologies into a centralized archive management system

Integrated file-based facilities

Broadcasters

Around half the Broadcasters reported their integration of all used storage technologies into a centralized archive management system.

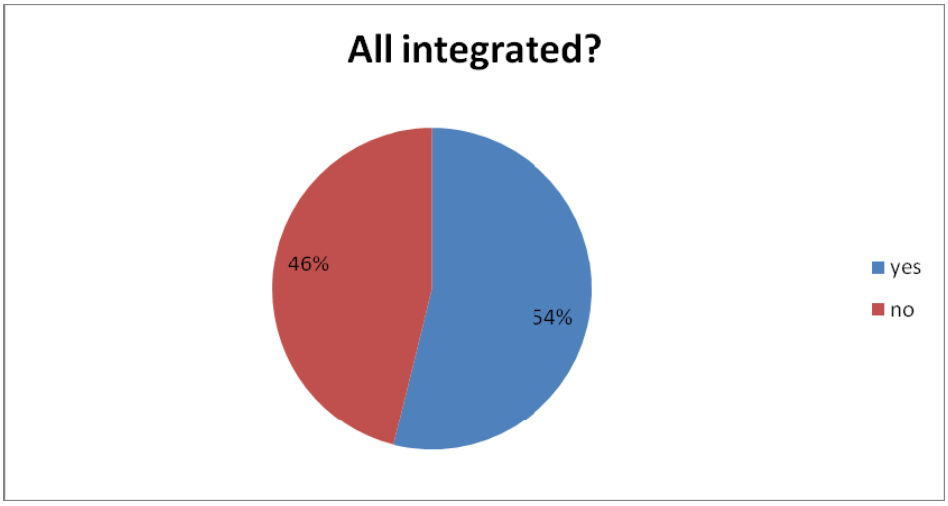


Figure 43: (Experienced Broadcasters' responses)

Vendors

A majority of Vendors indicate their wish to integrate / be able to integrate heterogeneous storages 'under one roof'.

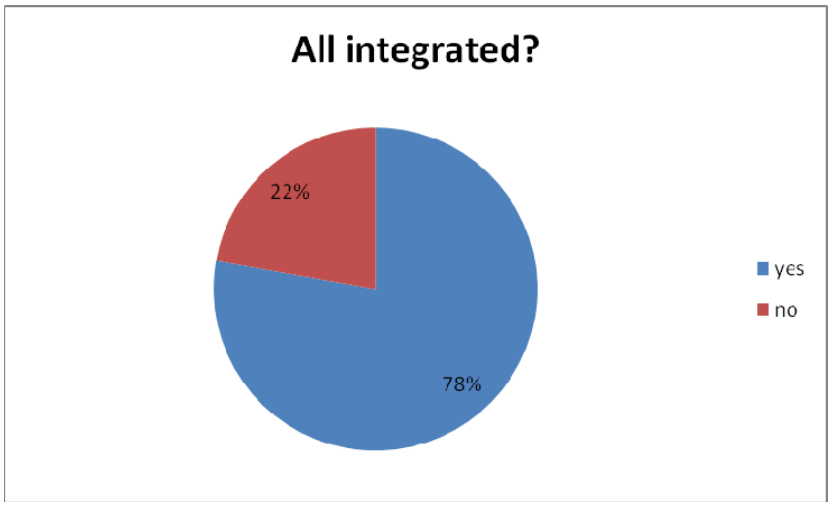


Figure 44: (Vendors' responses)

However, as one of the Vendors mentioned, new storage technologies and architecture developments can work against the ability to integrate, as it might take some time to cover them under this 'roof'.

This statement really needs more consideration unless open and widely used interfaces and protocols are provided.

4.7.3 Managing storage system failures (data corruption)

Integrated file-based facilities

Broadcasters

Broadcasters reported their management of storage system failures (data corruption) in the following ways:

- Re-ingest from backup video tapes (most common) – but usually tend to change to data backup
- Use data backup/mirroring (raid 1)
- Use hardware mirroring for online storage

- Use procedures including corrupted tape expertise
- Outsource whole storage service

Some Broadcasters admit they are not prepared for it.

Vendors

Except for the IT-based means of managing storage failures as reported by Broadcasters, Vendors reported some additional methods here:

- Verify Content before it goes into the library
- Use a failover system with redundant storage mechanisms

4.7.4 Hierarchical Storage Management

Keeping archived files in Online Storage (for some time), in order not to have to retrieve them from tape again.

Integrated file-based facilities

Broadcasters

Most Broadcasters reported their use of hierarchical storage management. One of the exceptions was reported by the representative of a facility external to the production environment.

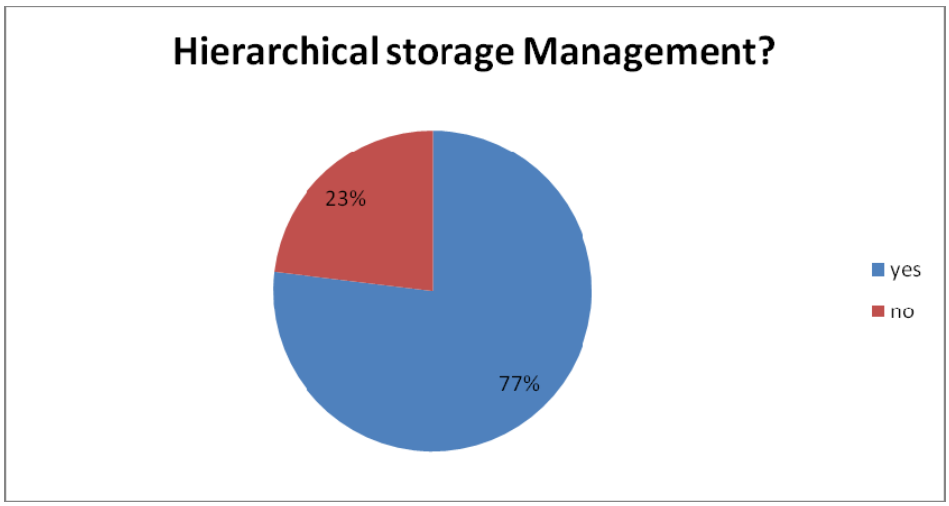


Figure 45: (Experienced Broadcasters' responses)

Vendors

In general, Vendors use or are able to use hierarchical storage management. From a MAM Vendor perspective, this is usually done with the deployment of non in-house storage technologies. To make this possible, strong support from experienced IT systems integrators is required.

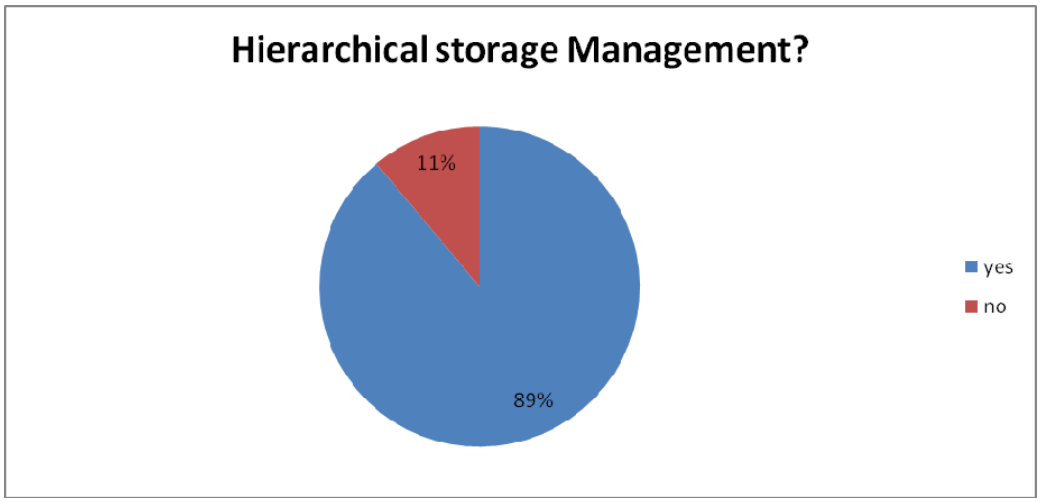


Figure 46: (Vendors' responses)

When asked about storage capacity for the individual areas of a hierarchical storage environment, one Vendor indicated the following practice:

Online storage	< 2k hours of programme material
Near line storage	< 50k hours of programme material
Off line storage	>> 50k hours of programme material

4.8 Technical questions: migration

4.8.1 Legacy tape migration – manual vs. automatic

Integrated file-based facilities

Broadcasters

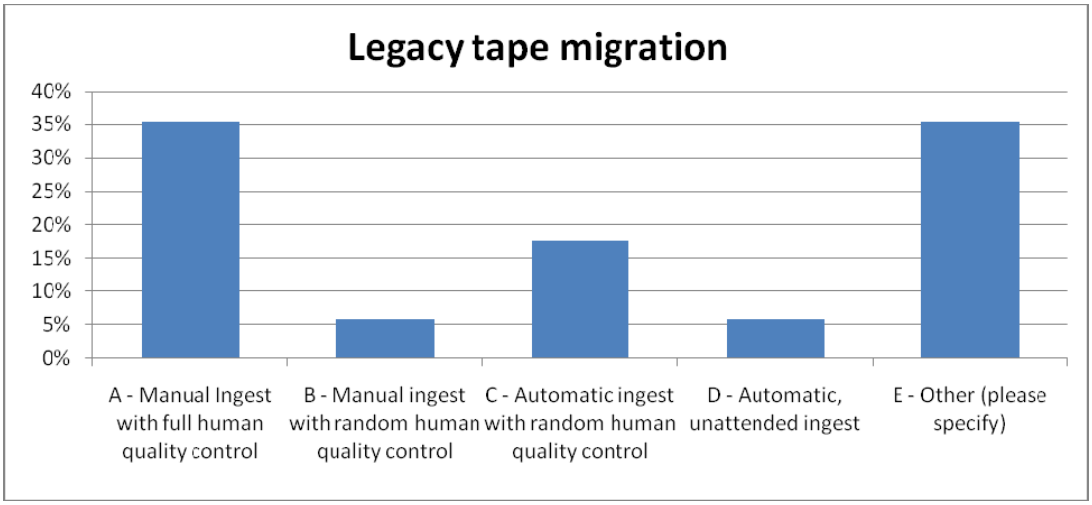


Figure 47: (Experienced Broadcasters' responses)

Most Broadcasters still use mainly manual ingest with either full human or human attended quality control. As one of the respondents mentioned, the ingest process is highly dependent on the original media format, e.g. 'more automation (…) is possible with Digital Betas, but more manual work with analogue Betas, 1" and other older material'.

Also, two 'extreme' options not listed in the survey were indicated (as 'other'):

- Manual ingest with automated quality control
- Automatic ingest with full human quality control

Vendors

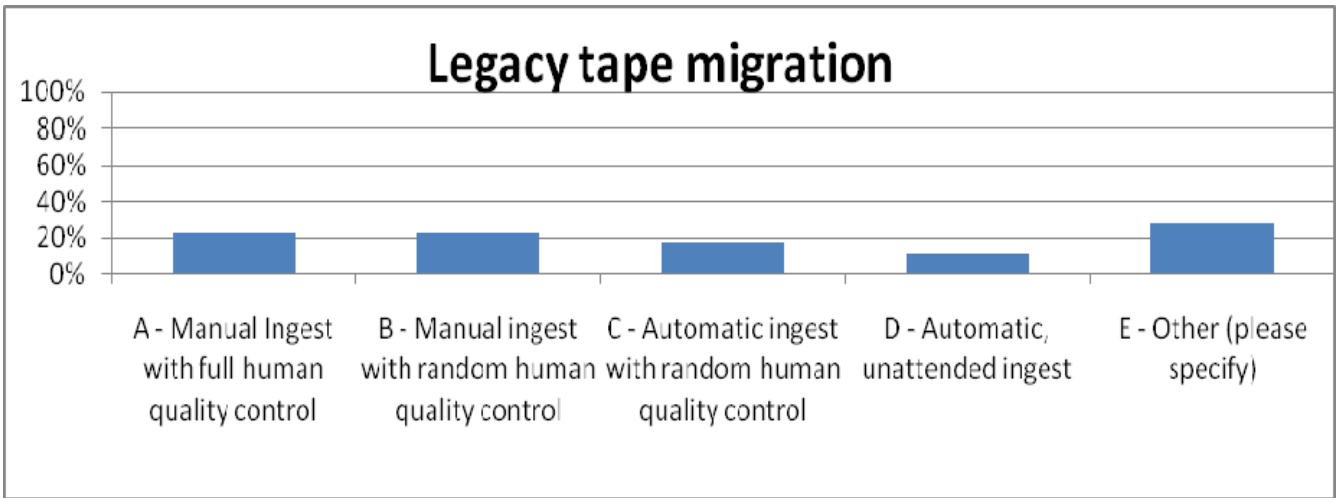


Figure 48: (Vendors' responses)

Vendors also observe more manual ingest usage, though they seem to be slightly more optimistic about automation, both with regard to ingest itself and to quality control.

Interestingly, as previously reported (by Broadcasters) the media format was regarded a factor in determining the characteristics of the ingest process. One of the Vendors indicated the cost model adopted by the customer and the cost of the resource.

One of the Vendors distinguished an additional phase – transcoding. In that case this might be the only automated sub-process (with transcoding QC), while ingest and overall QC remain manual.

4.8.2 Legacy tape migration – figures in hours

Only a few responses were received here, with results not specific to any of the legacy tape migration options given before. In general, regardless of the migration option chosen, Broadcasters report from thousands to hundreds of thousands of hours to be ingested.

4.8.3 Integrating legacy files into the archive

Individual responses show that similarly to legacy media, legacy file-based collections range from thousands of hours to hundreds of thousands of hours. Reported Essence formats include DVCPro25 and 50, MPEG-2 long GOP and DNxHD.

Vendors did not provide any input here.

4.8.4 Temporary file-based storage (while waiting for online storage to become available)

Integrated file-based facilities

Broadcasters

Respondents report (with a low response rate) the use of interim file-based storage within all provided technology options:

- Optical disks (XDCAM)
- Hard disks on a shelf
- IT infrastructure backups

These collections range from a few hundred hours to thousands of hours, but do not exceed 15k hours.

4.8.5 Automatic quality check

Integrated file-based facilities

Broadcasters

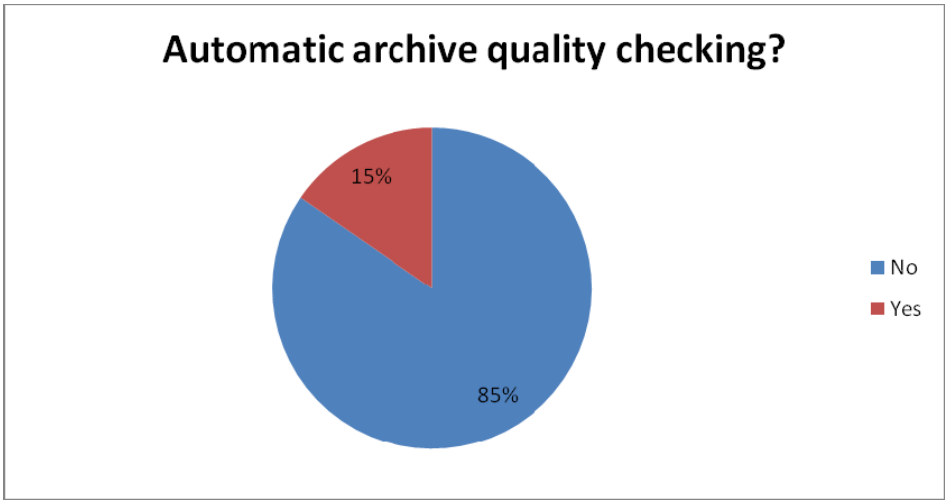


Figure 49: (Experienced Broadcasters' responses)

Only 15% of Broadcasters with integrated file-based facilities report their use of automatic quality checking of their archives. One of those who does use automatic checking admits to not having much experience in this area, currently.

Vendors

Vendors' results suggest more usage of/readiness to use automatic archive quality checking. A few quality control (QC) systems characteristics mentioned here include:

- QC system as a module option, which can be easily integrated with customer's archive system, ingest equipment etc.
- QC system as a module option within whole workflow/dataflow systems
- QC as system to 'verify only bits and bytes', or to check the quality on the Content level ('Content quality aware system ').
- QC as a system to check accuracy of the Metadata concerning Content structure

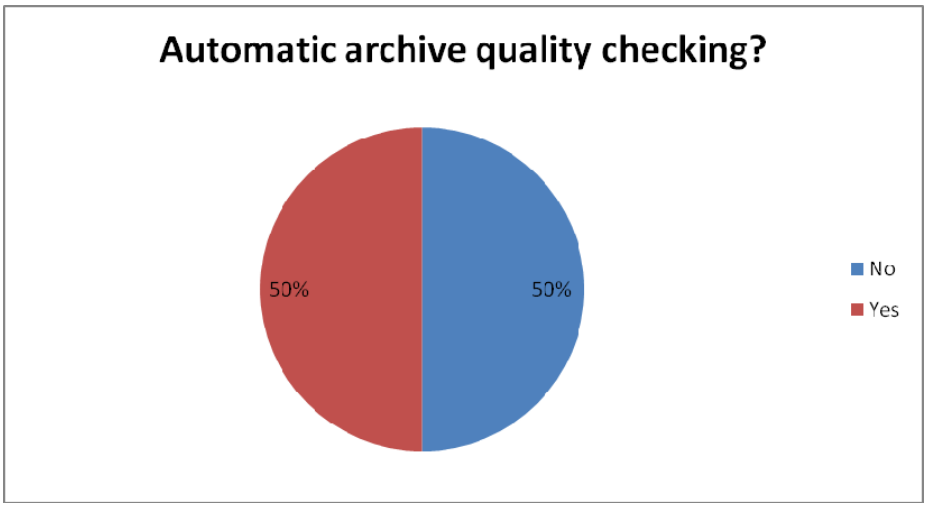


Figure 50: (Vendors' responses)

4.8.6 Redundancies

Integrated file-based facilities

Broadcasters

Broadcasters reported the following redundancy options implemented within their archive facilities:

- No redundancy
- Backup on video tapes
- Duplicates, or more file copies on same media
- Files copies on separate media (data tapes, hard drives) - online, offline.
- Separate file copies on-site and off-site

Vendors

Vendors indicate different methods of preserving redundancy depending on the service:

- Online storage – RAID
- Offline storage - replication
- Database – clustering, services distribution

Vendors report on redundancy strategies within the context of planning and implementation of failover and disaster recovery technology and procedures. Load balancing based on redundant data and services was also mentioned.

4.8.7 Maximum catastrophe of Content loss - presumptions and precautions

Broadcasters reported that they undertake the following precautions against a large catastrophe in their archive centre:

- Separate location (floor, building)
- Separate storage system
- Data tape duplicates
- Video tape copies
- Disaster recovery technology for the archive system

4.9 Technical questions: storage costs

Integrated file-based facilities

Broadcasters

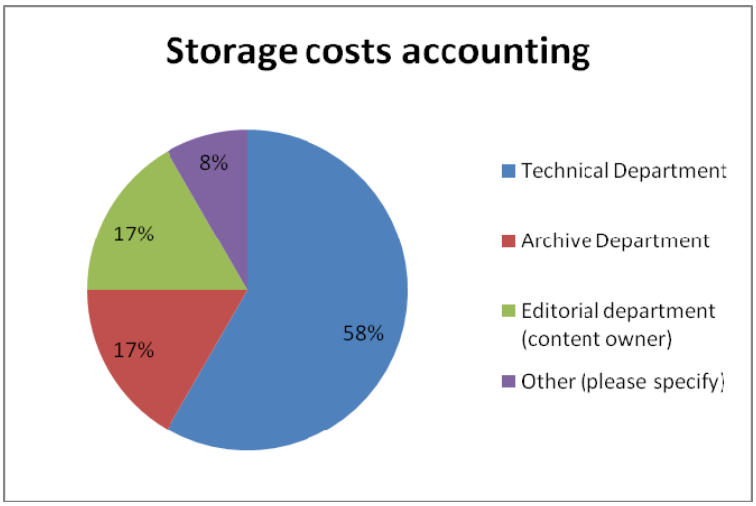


Figure 51: (Experienced Broadcasters' responses)

Most Broadcasters reported that the storage costs of their archive collections are accounted against resources of a technical department. In such case, these resources might be based on an estimation prepared by an archive or editorial department ('other').

The above method seems a simple, but not necessarily the most effective (from an overall company business perspective) way of accounting for the technical infrastructure costs. That is why examples of accounting storage costs against archive and editorial departments given by Broadcasters are especially worth further investigation.

Vendors

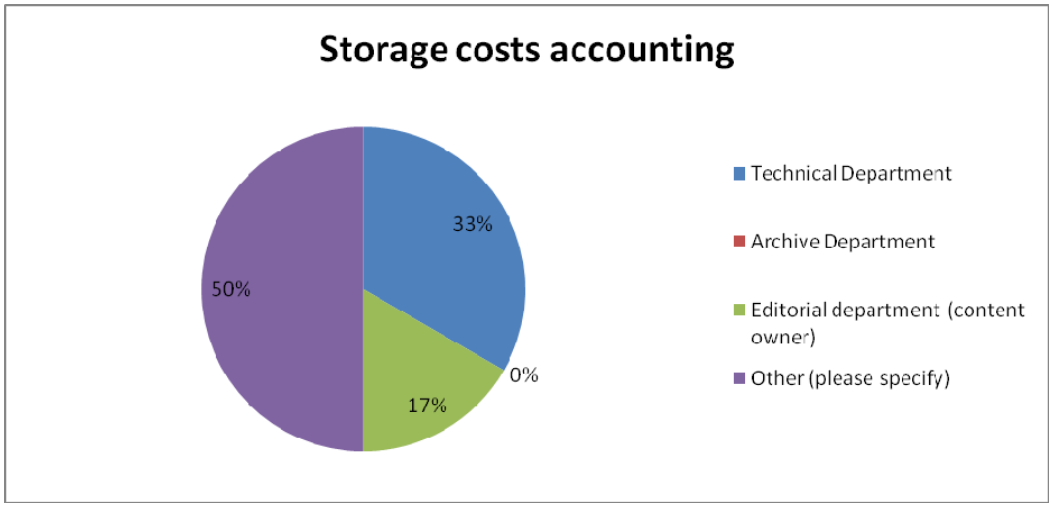


Figure 52: (Vendors' responses)

Vendors provided only a few results, however most of them indicate a 'traditional' approach where either the technical or the IT department are charged for storage.

In one reported case the technical and archive department share the storage costs.

4.10 Technology - conclusions

Broadcasters realize that shifting Content management technology towards IT-based environments represents an organizational, technical and economic challenge. This migration must fundamentally

changes the way that Broadcasters and technology providers perceive the role and place of the digital archive within the television production workflow.

Regarding the technology aspect, the traditional way of planning and implementing television systems must be changed. As demand for efficient sharing and repurposing of Content grows, integration, collaboration and openness in technologies have never been so important. The survey results do partially confirm that those changes are taking place.

Moreover, there may be a divergence between the strategies of television technology providers and users of future solutions. These disparities also exist between users themselves.

Broadcasters expect that technology Vendors employ standards compliant solutions, at least at the level of:

- System interfaces
- Content formats
- MAM functions

In practice, however:

- It is difficult for a single Broadcaster to effectively require standardized solutions, when they are not offered by manufacturers and their Vendors.
- Manufacturers do not always develop standardized solutions, because:
  - The use of specific standards is dependent on the pertinence of their business.
  - The use of specific standards is very cautiously introduced by the customers in their requirements (especially in Public Tender procedure), as it might raise an implementation risk associated with demanding a product that does not exist.

As the initiative is on the demand side (the Broadcasters' side), the critical factor here is one of scale. This means that also in the archive area, there is an essential strategic role for the EBU to represent the expectations of all its Members to benefit from standardized solutions.

To maximize this role, the EBU must know where the relevant standards are in their lifecycle and what impact the standards are having on real-world use of related technologies, so that Broadcasters can track the standards, easily recognize their implementations and relate to them in their own requirements.

P/DATA recommendations on digital archives should be a part of this strategy.

It is clear that to plan, develop and implement technologically advanced and cost-effective archive systems requires the close co-operation of users with technology providers. It should be noted that the survey results show great expectations towards organizations such as the EBU, which should, together with technology providers, set the standards and directions of technical development of the television market.

5. Project Management (PM)

5.1 Problems in running an archive system integration project

Integrated file-based facilities

Broadcasters

Experienced Broadcasters identified the following top five problems in running an archive system integration project:

Broadcasters' Top 5 Project Management Problems

Project Management Problem	Scoring
1. Customer not ready for workflow/organizational changes	73
2. Legacy systems needing specific integration (and cleaning up)	61
3. Lack of Vendors' understanding of the customer needs	59
4. Unclear decision process (client-side)	55
5. Requirements lead to offering equipment not yet released or just released	52
6. Expectation mismatch (user expects system A and Vendor builds system B)	39
7. Over-specification of requirements (e.g. due to EC rules)	11

(Experienced Broadcasters' responses)

By pointing out the three critical factors:

- Customer's organization/workflow is not ready for changes
- Legacy technology integration is an issue
- Vendor's awareness of customer's needs is not good enough

Broadcasters emphasize the importance of the project preparation phase to both customers and Vendors. The preparation phase should at least identify the current responsibilities and workflows. The technology should also be well known to the Broadcaster's project team.

Vendors

In general, Vendors' results confirm the Broadcasters' ranking.

Vendors' Top 5 Project Management Problems

Project Management Problem	Scoring
1. Customer not ready for workflow/organizational changes	81
2. Legacy systems needing specific integration (and cleaning up)	66
Lack of Vendors' understanding of the customer needs	66
Unclear decision process (client-side)	66
3. Requirements lead to offering equipment not yet released or just released	59
4. Over-specification of requirements (e.g. due to EC rules)	53
5. Expectation mismatch (user expects system A and Vendor builds system B)	9

(Vendors' responses)

The problem of 'over-specification of requirements' seems though to be more perceived by Vendors. The 'over specification' problem may lead to development challenges: 'We try to make our solution more and more flexible, weighing against the risk of making it too complicated'.

Vendors report the (archive integration) projects as the most complex (in technology and workflow) that a Broadcaster can undertake. Therefore, special project management measures should be adhered to:

- 'A true adoption of an IT system integration (software specification) process'.
  'The most effective way to develop a common understanding of requirements and a better estimate of costs and risks. This usually provides a better project result for the users, the customer, the Vendors and the system integrator(s)'
- 'A common (and open) view of project risks is essential.
  Shared risk mitigation strategies give a much higher chance of success.'

5.2 Project Management methodology

Integrated file-based facilities

Broadcasters

Two third of the Broadcasters did not follow any formalized project management methodology procedure in their archive projects. The third that did declared to have used one of the following methods:

- Prince2 management tool
- PMBOK (Project Management Body Of Knowledge - PMI std)
- An adaptation of one of the above
- An in-house method

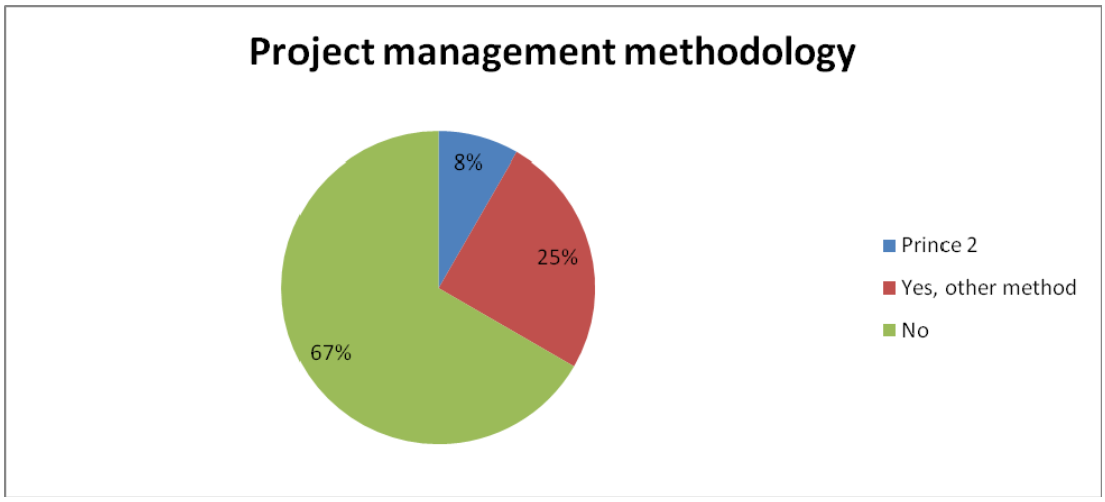


Figure 53: (Experienced Broadcasters' responses)

These results seem to harmonize with the Broadcasters' general approach to the PM methodology – it's regarded as the least important measure (out of the options presented in the survey) to have a successful file-based archive integration project.

Vendors

Vendors tend either to bring their methodology into customer's organization (usually Prince2 or PMBOK based) or use a customer-proposed methodology.

Partially file-based facilities

About 40% of the respondents declared to follow an established PM methodology, most didn't. A lack the necessary PM methodology awareness seems an important cause.

5.3 Project execution

5.3.1 Archive as part of a larger programme

In most cases, an archive project is a part of a larger programme for Broadcasters.

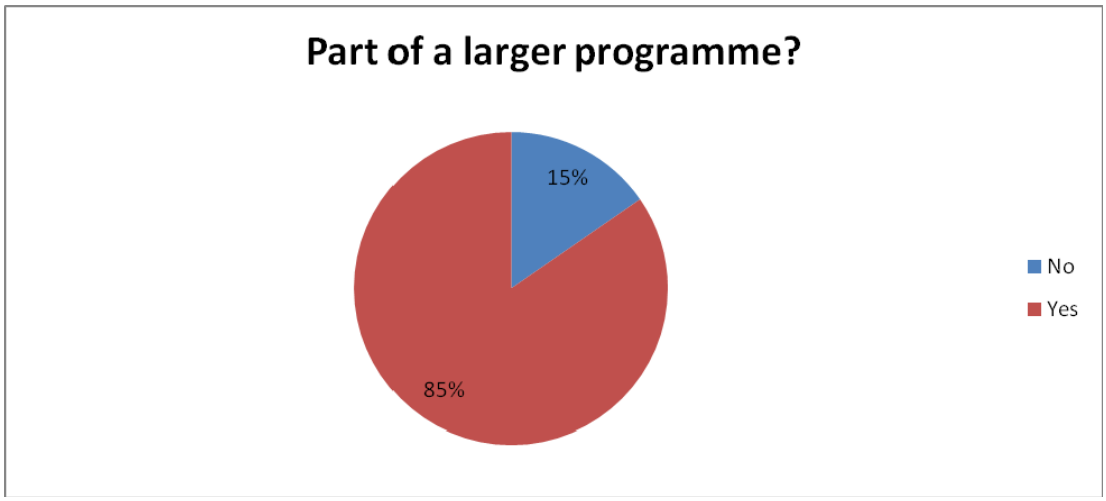


Figure 54: (Experienced Broadcasters' responses)

The most common 'larger programme' is that of a fully file-based integrated production environment. In general, all digital archives benefits apply here, whilst 'asset repurposing for new media business opportunity' was explicitly mentioned.

5.3.2 Archive integration in relation to organizational changes

In most cases, an archive (integration) project is related to organizational changes.

The 5 most common organizational changes are listed below:

Broadcasters' Top 5 organizational changes related to their archive project

Organizational Change	Scoring
1. Change of people roles (e.g. journalists -> editing)	42
2. Change of departmental roles (e.g. IT running the archive system)	33
Integration of departments (IT & Broadcast)	33
3. Requirement for staff reduction	25
4. Outsourcing archive operations/maintenance	17
No change	17

(Experienced Broadcasters' responses)

Additionally, a premises change was mentioned, which may also drive an overall shift towards new technology.

5.3.3 Archive Project procurement procedures

The majority of public Broadcasters use Public Tender procedures in order to acquire and implement new technology. This is due to legal rules either within the EU or within the country concerned.

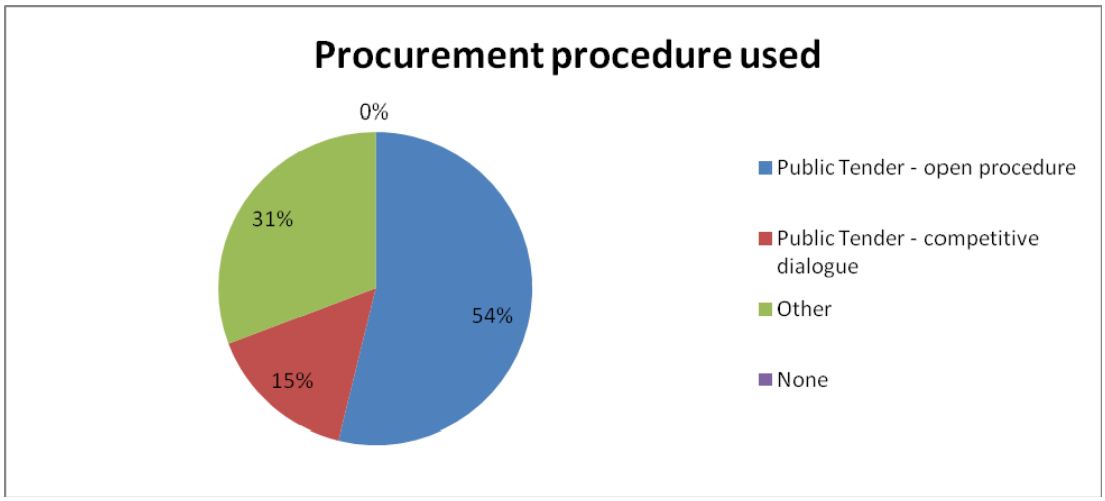


Figure 55: (Experienced Broadcasters' responses)

Most of the Broadcasters run an open procedure, though competitive dialogue is also used. The former course requires more preparation prior to the procurement, while the latter renders the Tender course more complex.

5.3.4 Delivery of an expected product

Integrated file-based facilities

Broadcasters

Over 80% of the Broadcasters declared that their project had been finished with their expected result achieved.

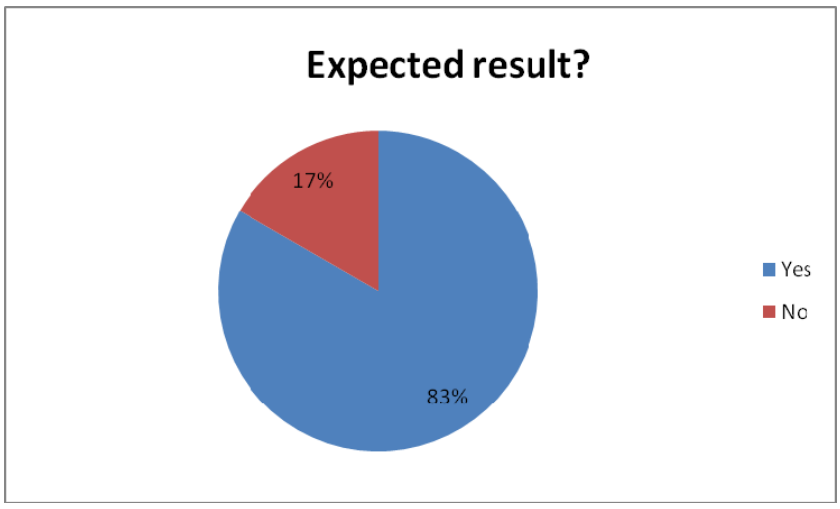


Figure 56: (Experienced Broadcasters' responses)

Vendors

One of the Vendors referred its current project as an ongoing activity, as they seek 'to integrate ever more of customers' and prospects' wishes'. To avoid this 'ongoing activity' it is crucial for the Broadcaster to split its archive integration into well defined phases, each of which will be easy to manage and will provide business value within an expected time frame.

5.3.5 Delivering the product within the planned time

According to the survey, over 40% of projects did not finish on time.

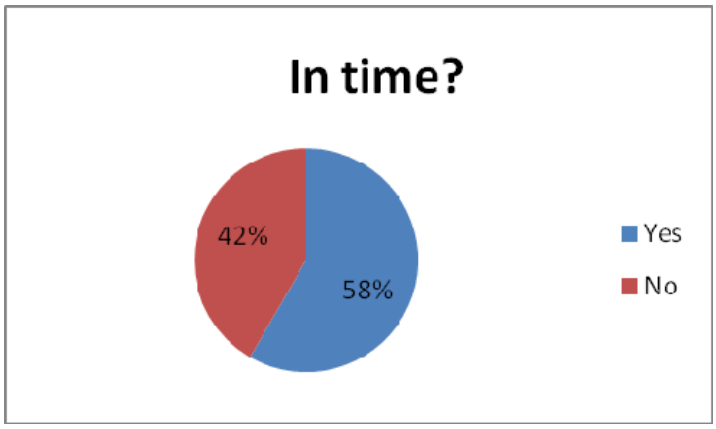


Figure 57: (Experienced Broadcasters' responses)

The reasons mentioned are listed below:

- Organization itself not ready
- Internal change management
- Lack of project resources both at Vendor's and customer's sides
- Economic problems
- Technical problems
- Technical infrastructure not ready
- Integration issues

It is worth mentioning that almost all of the delayed projects (except for one) did not follow any PM methodology.

5.3.6 Delivering the product within the projected budget

Almost 75% of respondents declared that their project finished within the budget. Issues preventing the other 25% from completion within budget are:

- Ongoing technical problems
- More investment needed

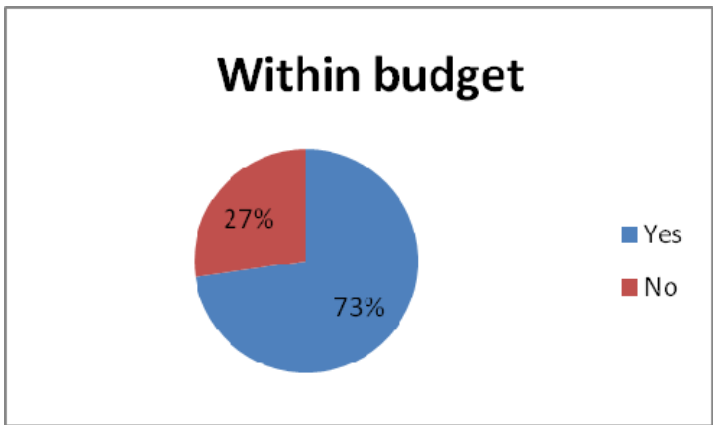


Figure 58: (Experienced Broadcasters' responses)

5.3.7 Unexpected integration problems

Integrated file-based facilities

Broadcasters

20% of respondents declared that they had faced unexpected integration issues.

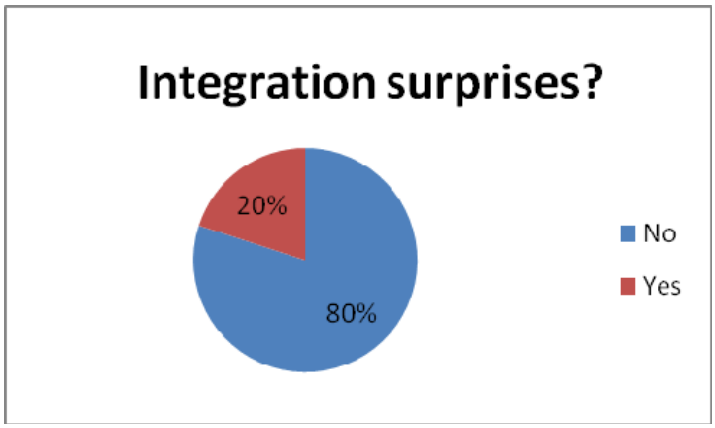


Figure 59: (Experienced Broadcasters' responses)

The following were the problems reported:

- Problems with software and middleware modules.
- When using an Enterprise Service Bus (ESB), shifting problems from integrations 'from scratch' towards stabilizing the ESB.

Vendors

Most of the Vendors reported problems, notably:

- Network issues
- Automated transcoding issues
- File stubbing issues

5.3.8 Significant project scope changes

Broadcasters

20% of the Broadcasters reported scope changes usually towards limiting the original scope by making decisions to postpone some functionalities, integrations, etc...

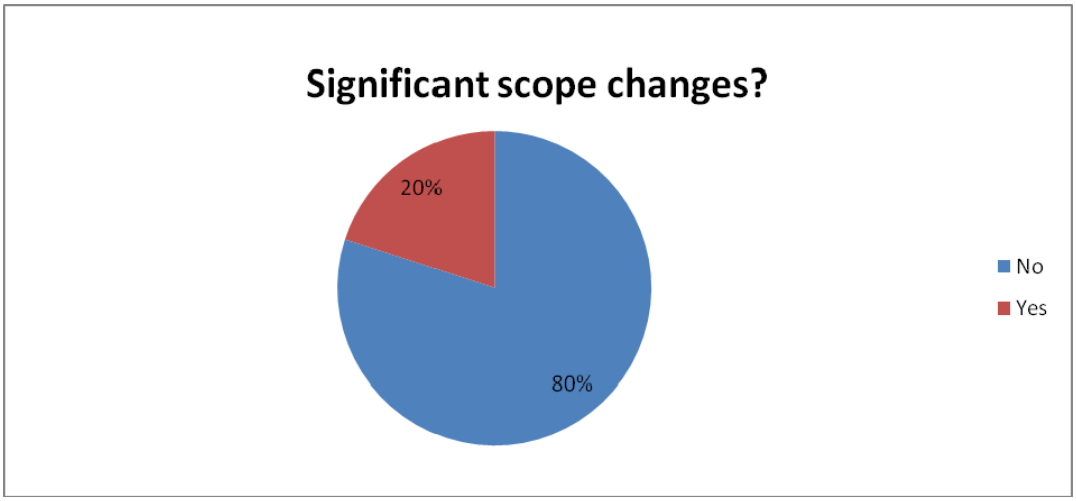


Figure 60: (Experienced Broadcasters' responses)

5.3.9 Running an archive project – general advice

Integrated file-based facilities

Broadcasters

Broadcasters stress that technology changes, new workflows and project management all need careful planning. In particular:

- **In project management**
  - Specify precise and stable requirements and the scope of the project.
  - Clearly define the specifications.
  - Provide the project group with enough resources.
  - Have a strong project manager (with knowledge and decision-making capacity).
  - Choose committed people throughout the company for the project group.
  - In addition to the technical project, set up a separate implementation & training project.
- **In workflows**
  - Describe and agree on the new workflows internally before making the system descriptions.
  - Make sure your workflows are ready and stable.
  - Establish an internal change management programme to involve all users.
  - Adequate training and a full scale trial run should be included before system launch.
- **In Content management**
  - If possible, digitize key-material of your tape-archive before going on air.
- **In technology**
  - Make sure to have proper support of delivered technology; bear in mind the technology continuity capability when considering given products.

Note that all of the above guidelines (except those related to Content Management) are common generic project management guidelines.

Vendors

Possibly missing in the above is a business level approach. This was, however, pointed out by Vendors.

In general, a 'top down vision' is strongly recommended:

- **First, specify your business goals**
  - This does however require at least some awareness of new technology capabilities. Therefore, a multidisciplinary (business, technology, PM) person/approach will be a great driver for the changes.
- **Find their implications on a functional and workflows level.**
  - Planning the workflow is a crucial stage of the project. An essential part of a workflow plan is a designation of user profiles / competencies.
- **Clearly define the functional and non-functional requirements.**
  - Namely – document them.
- **Have an open discussion with Vendors and integrators to verify the requirements.**
  - This is just about being realistic. Many tenders failed due to over-specification or through demanding functions that are hard to implement and within a given budget.
- **Select technology that best suits the requirement – MAM, hardware infrastructure, etc.**
  - This usually means a selection within the tender procurement.

And more generally:

- Plan your goals with a 5 year time frame in mind.
- Engage key staff members early in the project.
- Start a change management plan as early as possible.
- Look at the archive project as a part of a complete digitization strategy.
- Ensure an adequate budget (don't forget some safety margin).

5.4 How could Broadcasters improve the result?

Integrated file-based facilities

Broadcasters

According to Broadcasters, the following top five measures were considered important for Broadcasters to realise a successful file-based archive integration project:

Broadcasters' Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Be consistent in the requirements & scope of the project	85
2. Have a strong project manager	83
Build an internal project team	83
3. Do a proof of concept first (and scale if successful)	75
4. Establish a common way to express requirements	73
Ensure strong support from senior management	73
5. Do not use consultants as decision makers	69
6. Have a single entity for problems solving	65
7. Provide information on your in-house standard	60
8. Select a strong project structure (e.g. easy-win first)	58
9. Use Project Management methodology	40

(Experienced Broadcasters' responses)

Reserving enough project resources was additionally remarked by one of the Broadcasters as an important measure.

Vendors

According to Vendors, the following top five measures were considered important for Broadcasters to realise a successful file-based archive integration project:

Broadcasters' Top 5 measures for a successful Project – Vendors' opinion

Project Success Measure	Scoring
1. Be consistent in the requirements & scope of the project	92
2. Do a proof of concept first (and scale if successful)	72
3. Have a strong project manager	69
4. Ensure strong support from senior management	67
5. Build an internal project team	64
6. Provide information on your in-house standard	61
Have a single entity for problems solving	61
7. Select a strong project structure (e.g. easy-win first)	48

8. Use Project Management methodology	56
Establish a common way to express requirements	56
9. Do not use consultants as decision makers	50

(Vendors' responses)

Having a consistency in the requirements and the project's scope is a clear winner for both Vendors and customers with integrated file-based environments. Also, a strong project manager and internal project team are much appreciated.

Vendors more highly value the proof of concept idea than do Broadcasters.

Also, (not ranked) open discussions with Vendors early in the process are suggested:

'Vendors can help to identify potential issues, can bring different visions, and can assist in strategic decision.'

This presales phase can also be seen as 'consulting'.

It is often efficient for the customer's project structure to 'match integrator structure - communications at all levels', but preserving 'clear escalation rules'. This approach helps 'maintaining a joint technical design team, having common tools for requirements, design and workflow.'

'Building users into the decision-making and development processes' is another measure for success pointed by Vendors.

On the other hand, Broadcasters observe more benefits in a common way of expressing their requirements. That clearly implies that it's Broadcasters' task to find a good way to do so.

Partially file-based facilities

Broadcasters

A 'measures for a successful project' ranking compiled from the responses from Broadcasters with partially file-based facilities is presented below, mainly for the following reasons:

- When compared to Integrated file-based Broadcasters' and Vendors' responses, considerable underestimation of consistency in the requirements & scope of the project was evident.
- Less appreciation for proof of concept experience was evident.

Broadcasters' Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Have a strong project manager	80
2. Build an internal project team	77
3. Ensure strong support from senior management	71
4. Be consistent in the requirements & scope of the project	68
5. Use Project Management methodology	66
6. Establish a common way to express requirements	64
7. Have a single entity for problems solving	63
8. Provide information on your in-house standards	59
Do not use consultants as decision makers	59
9. Select a strong project structure (e.g. easy-win first)	57
10. Do a proof of concept first (and scale if successful)	55

(Less-experienced Broadcasters' responses)

5.5 How could Vendors improve the result?

Integrated file-based facilities

Broadcasters

According to Broadcasters, the following top five measures were considered important for Vendors to realise a successful file-based archive integration project:

Vendors' Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Product expertise	87
2. Recognize and consider customer's requirements and limitations	83
3. Maintain flexibility and readiness to change	77
4. Provide local support	67
Enforce the requirement to follow proper project procedures	67

(Experienced Broadcasters' responses)

Vendors

According to Vendors, the following top five measures were considered important for Vendors to realise a successful file-based archive integration project; Vendors' results present almost the same order as Broadcasters':

Vendors' Top 5 measures for a successful Project – Vendors' opinion

Project Success Measure	Scoring
1. Product expertise	84
Recognize and consider customer's requirements and limitations	84
2. Maintain flexibility and readiness to change	81
3. Provide local support	78
4. Enforce the requirement to follow proper project procedures	13

(Vendors' responses)

The results confirm the importance of a consultancy phase and an ongoing technology support and expertise. Vendors also mentioned the importance of best practices and workflow expertise.

Partially file-based facilities

Broadcasters

Vendors' Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Recognize and consider customer's requirements and limitations	84
2. Product expertise	79
3. Maintain flexibility and readiness to change	77
4. Provide local support	68
5. Enforce the requirement to follow proper project procedures	61

(Less-experienced Broadcasters' responses)

5.6 How could the EBU (or other organizations) improve the result?

Integrated file-based facilities

Broadcasters

According to Broadcasters, the following top five measures were considered important for the EBU (or other organizations) to help Broadcasters realise a successful file-based archive integration project:

EBU's Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Publish recommendations on standards and also user requirements	77
2. Sharing & education in seminars	73
3. Push for standardization (e.g. scheduling BXF interface)	71
Members' Project experiences and best practice recommendations	71
Map of technology and completed integrations by Broadcasters. Unimportant	71
4. Provide 'best practices' specifications on business processes	69

(Experienced Broadcasters' responses)

Vendors

Vendors reported the following results:

EBU's Top 5 measures for a successful Project – Vendors' opinion

Project Success Measure	Scoring
1. Publish recommendations on standards and also user requirements	86
2. Members' Project experiences and best practice recommendations	75
3. Push for standardization (e.g. scheduling BXF interface)	72
4. Sharing & education in seminars	69
5. Provide 'best practices' specifications on business processes	67
6. Map of technology and completed integrations by Broadcasters. Unimportant	64

(Vendors' responses)

Partially file-based facilities

Broadcasters

A significant divergence of less-experienced Broadcasters' expectations of the EBU's role was observed:

EBU's Top 5 measures for a successful Project – Broadcasters' opinion

Project Success Measure	Scoring
1. Map of technology and completed integrations by Broadcasters	79
2. Publish recommendations on standards and also user requirements	75
3. Members' Project experiences and best practice recommendations	73
Provide 'best practices' specifications on business processes	73
4. Push for standardization (e.g. scheduling BXF interface)	64

5. Sharing & education in seminars (e.g. on SOA, PM, etc.)	63

(Less-experienced Broadcasters' responses)

For those Broadcasters, the practical experience and technology implementation cases seem to present more value than standardization activities.

5.7 Project management - conclusions

5.7.1 Project management in general

Well known project management rules apply here. The following practices were pointed out in the survey:

- Follow a top down vision; first define your business goals, then set your requirements on workflows and delivered functionalities, then plan technology capable of meeting the requirements.
- Prepare your organization for changes – have senior management support, but also engage future users and stake-holders.

  Organizational problems were especially indicated by Broadcasters in the survey. It should be emphasized that this is not only workflow change related, which renders most resistance, but also to changes in competencies.
- Follow a project methodology that best suits your needs, which effectively means:
  - Follow any PM methodology rather than none.

    As the survey shows, a significant number of digital archive projects were not finished in time. Though there were several reasons mentioned, a common factor was the lack of a PM methodology.
  - Try to use similar PM standards on both the customer and Vendor sides.

5.7.2 Project management in digital archive implementations

Both Broadcasters and Vendors show a great concern in the area of adequately specifying requirements. Vendors, on the one hand, identify a problem of 'over-specification', whilst, on the other hand, Broadcasters struggle to define comprehensive requirements, which they feel is the safest way within their procedural domain (Public Tender).

The following hints compiled from both sides might help to find the best balance:

- If a digital archive project influences other areas of the facility, construct a general digitization strategy and a change management (and organizational) plan.
- When specifying business goals, workflows and functional requirements, a degree of technology awareness is strongly recommended. This will allow for better recognition of new ideas within a project group and the ability to verify them. That is why a multidisciplinary person (or group) role is crucial, starting with the planning phase.
- A consultancy phase is important. Discuss your needs with Vendors. If possible, do a Proof of Concept.
- Try to be consistent when expressing your requirements. This implies that you recognise prevailing technical standards and good practices and are consistent with them in your requirements. Support from the EBU and other supporting/standardisation bodies will facilitate:
  - Knowledge about the standards impacting your requirements.
  - Knowledge about where these standards are practically implemented within real production environments, with feedback on their impact.
- If you need to retain [some of] your legacy technology, be aware that its integration within a new system may become an extremely resource- and time-consuming part of the project.

- Be careful about the hype surrounding new technology (ESB, SOA, etc.) when considering them as a panacea for current problems – these solutions might only shift your problems into new areas.
- When deciding on a tender procedure (open tender or competitive dialogue), calculate your time constraints and other resources, your risks and possible gains. Competitive dialogue may provide you more flexibility, but on the other hand it requires better control and project management.

6. Parameters for an archive system's service levels

The following values (results) are those that respondents to the questionnaires considered realistic (meaning 'as good as possible') with regard to the service level parameters of an archive system.

Where appropriate and in light of the low response rate to some questions within this section, individual responses are presented.

6.1 Reliability of the storage and managing infrastructure (MTBF)

Importance: very important.

Integrated file-based facilities

Broadcasters

- 2 failures per week.
- No single point of failure is allowed in the system.
- 99.999%.

Vendors

- >99.9% (with several levels of redundancy).
- 99.999%.

Partially file-based facilities

Broadcasters

- 99.99%.
- 100%.
- 100%.

Within the results obtained, Broadcasters (all together) present higher expectations, as half of them desire a storage and managing infrastructure with a 'no general failure' characteristic.

6.2 No. of simultaneous users - proxy resolution access only (minimum)

Importance: important.

Integrated file-based facilities

Broadcasters

Average = 132.

Vendors

- Load tests at 2500.
- 20.

Partially file-based facilities

Broadcasters

Average = 111.

In this case the Broadcasters specified values of much lower variation, typically between 110 and 130.

6.3 No. of simultaneous users – full resolution access (minimum)

Importance: somewhat important to important

Integrated file-based facilities

Broadcasters

Average = 32

Vendors

- 50 to 400 depending on (compression) format.
- 10.

Partially file-based facilities

Broadcasters

Average = 29.

Again, Broadcasters specified quite well defined expectations, with the number of full access users consistently around 30.

6.4 Overall in/out throughput (minimum hours of material per day)

Importance: very important.

Unless noted, no distinction for in/out traffic was provided.

Integrated file-based facilities

Broadcasters

- 30 in and 10 out.
- 5 TB in, equivalent to 200 hours of DV25 material.
- Depending on actual production loading.
- 15.

Vendors

- Depends on tape library Vendor. Up to 120 hours per device.
- 10.

Partially file-based facilities

Broadcasters

Average = 38.

6.5 Archive capacity (minimum number of hours of material of quality X)

Importance: important to very important.

Integrated file-based facilities

Broadcasters

- 3 Pbyte.
- 50000 hours of HD.

Vendors

- Case by case.

Partially file-based facilities

Broadcasters

- Infinite.
- 100000 hours at 50 Mbit/s.
- 20000 hours at 50 Mbit/s.
- 20000 hours at 25 Mbit/s.

6.6 Archive capacity expansion options (e.g. 'can grow to 10x current size')

Importance: very important.

Integrated file-based facilities

Broadcasters

- Extend library slots or migration to LTO5.
- Can grow to 10x current capacity.
- Virtually unlimited grow.

Vendors

- Depends on tape library Vendor.

Partially file-based facilities

Broadcasters

- Growth needs to be virtually infinite.
- Can grow using new support generation (e.g. LTO2 - LTO4).
- 100 000 hours of 50 Mbit/s.
- 4x.
- Can grow to 5x of yearly production volumes (i.e. 5x 8500 hrs).

6.7 Latency (from user perspective, 'max ... seconds after request')

Importance: very important.

Integrated file-based facilities

Broadcasters

Average: 10s.

Vendors

- Less than 0.5 s on a LAN.
- 5 s.

Partially file-based facilities

Broadcasters

Average: 13s.

Average expected proxy playback latency is specified around 10s. Vendors proposed lower values, although only two results were provided.

6.8 Acceptable Content retrieval time from archive and/or remote site

Importance: quite important to very important.

Integrated file-based facilities

Broadcasters

- 10 min.
- T+1 min if T ≤ 5 min; T +0 if T > 5 min (T = Content duration).

Vendors

- Several minutes.

Partially file-based facilities

Broadcasters

Average: 10 min.

Broadcasters in partially file-based facilities provided quite coherent input here, with an average value of 10 minutes.

6.9 Bandwidth restrictions related to remote use of the system

Importance: important.

Integrated file-based facilities

Broadcasters

- Archive system is accessible only at the premises.
- Enclosed system.
- None.

Vendors

- 100 kbit/s is sufficient, 300 kbit/s is comfortable.

Partially file-based facilities

Broadcasters

- No.
- Minimum 1 Mbit/s (to support lowest proxy resolution).
- 100 Mbit/s.
- 4 Mbit/s.

6.10 Acceptable planned and un-planned downtime per year

Importance: important to very important.

Integrated file-based facilities

Broadcasters

- One week.
- 00.1%.

Vendors

- if backup system exists, can be almost 0.
- N/A - we plan to keep system up as far as possible.

Partially file-based facilities

Broadcasters

- One hour per 24 hour period, at night.
- Some hours; to be planned in times with little traffic.
- 30 hours.
- Not considered yet.

Appendix A: Outsourcing

A1.1 General figures

Integrated file-based facilities

Broadcasters

Around one third of organizations use (or intend to use) contracted services for long-term storage and preservation of their Content.

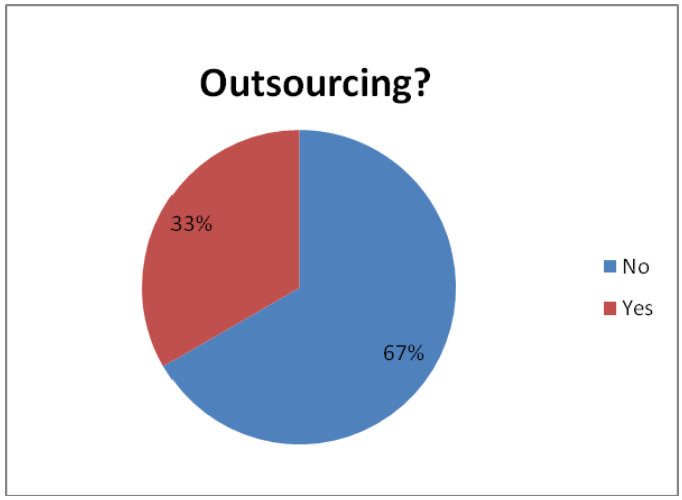


Figure A1: (Experienced Broadcasters' responses)

Those, who declare to do so, contract a subset of the following services:

- Data storage.
- System management.
- All video systems.
- All archive services.

Vendors

Vendors observe with time more requirements/requests for contracted services in archives area, which usually deals with costs saving. Also, 'it is sometimes seen as an easier option than building an archive.'

It is expected that 'outsourced service is a compelling model for the future, more and more companies will offer this model to customers.'

However, due to low interest in 'outsourcing' reflected in survey, these observations and expectations still need to be treated as individual voices.

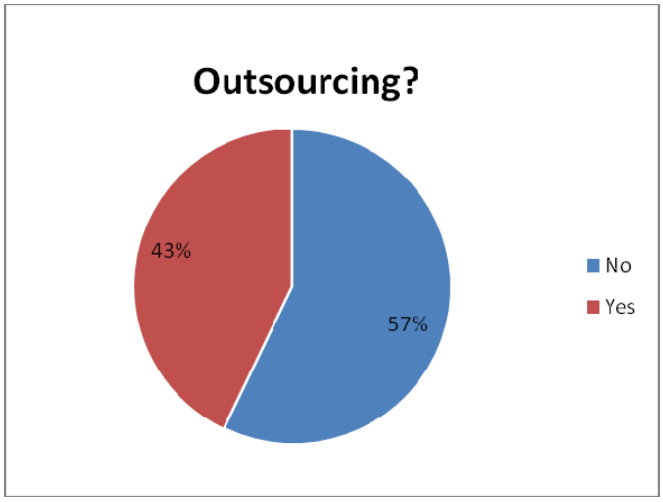


Figure A2: (Vendors' responses)

Partially file-based facilities

Broadcasters

Apparently, Broadcasters in partially file-based facilities express a bit more interest in outsourcing. However, the group of 'considering' contracted services will definitely polarize once the decision for digital archive implementation/integration is made.

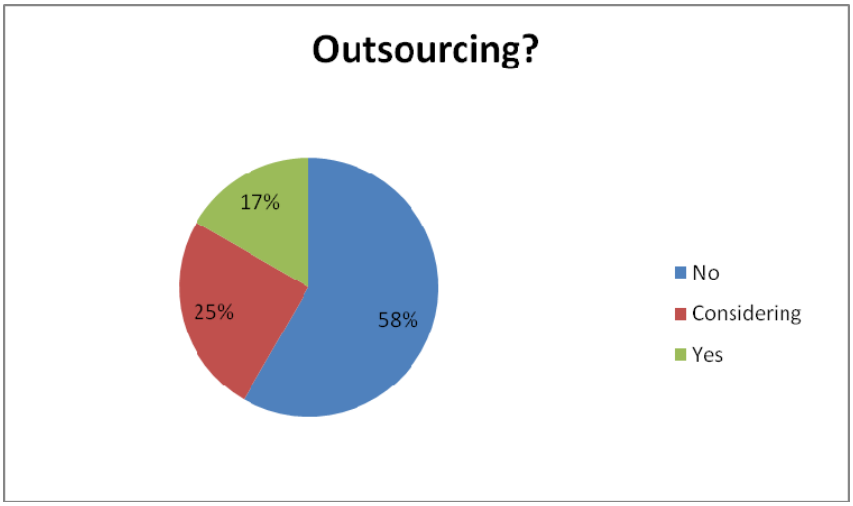


Figure A3: (Less-experienced Broadcasters' responses)

It seems (although, based on a low numbers of comments) there is a very limited awareness of possible implications of dividing/qualifying respective archive services as contracted or in-house owned ones. So far, Broadcasters expect to use contracted services either for technology support ('mass storage system, software and hardware support, future upgrading') or within a given archive role (e.g. 'preservation').

A1.2 Outsourced services - preferences

Integrated file-based facilities

Broadcasters

Broadcasters were asked to choose services/functions (technology oriented) that are, or that are going to be carried out by contract services (specifically for long-term storage of media files). The ranking chart is presented below.

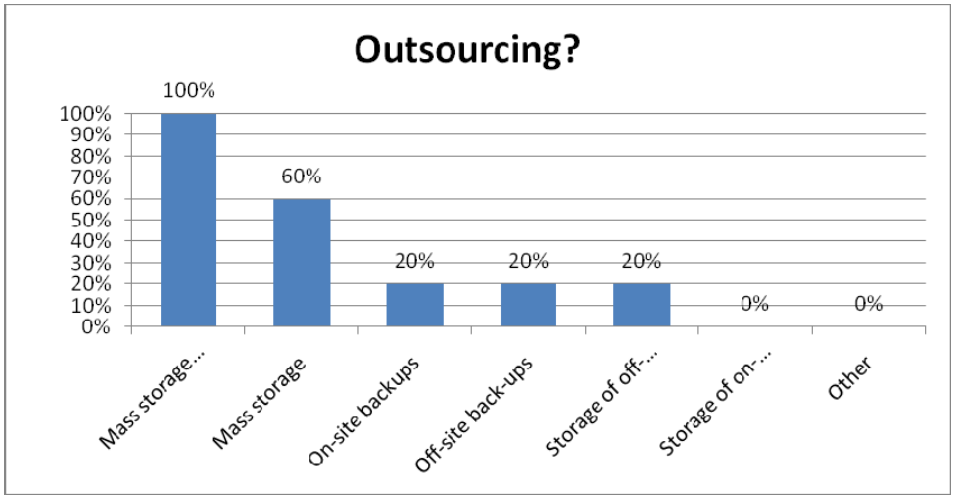


Figure A4: (Experienced Broadcasters' responses)

Within the given options, there is clear preference for contracting out mass storage maintenance or mass storage itself (buying, leasing, or acquiring it). Due to the lower response sample (responded to only by those who declare to use/plan to use contract services) the above results have to be treated with caution.

Vendors

Vendors reported similar preferences, with equally ranked mass storage maintenance and mass storage.

Partially file-based facilities

Broadcasters

Broadcasters from partially integrated file-based facilities tend to favour contracting out the service of mass storage maintenance.

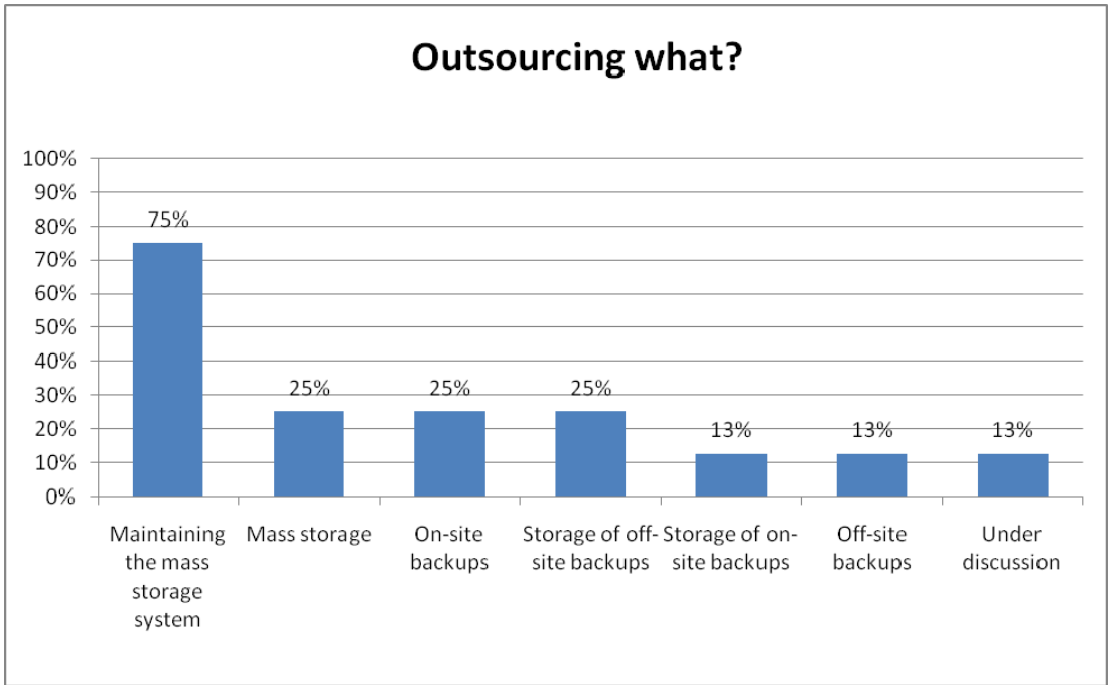


Figure A5: (Less-experienced Broadcasters' responses)

Please note that the above chart mainly expresses the Broadcasters' expectations. The results include responses from two Broadcasters who had previously declared their intention not to use/ or plan to use contract services.

A1.3 Outsourced functions - delegation

Integrated file-based facilities

Broadcasters

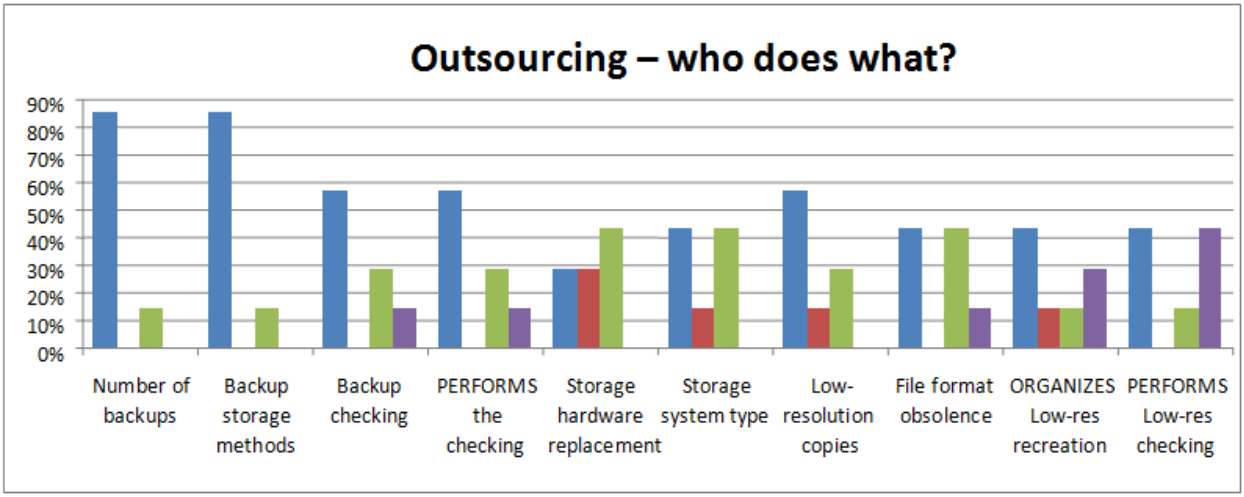
The following questions were asked to present Broadcasters' preference in delegating given functions to the contracted parties:

- Who decides how many backup copies of master material will be created?
- Who decides how they will be stored?
- Who decides how the backups will be checked, and how often?
- Who checks the backups?
- Who decides when storage hardware gets replaced?
- Who decides what kind of storage system to use?
- Who decides what kinds of low-resolution (access, proxy) copies are needed?
- Who decides when a file format is obsolete?
- Who organizes remaking of new low-resolution files from master files?
- Who checks low-resolution files, to ensure they have no problems?

The term 'Backup copy' was used simply to mean an extra copy of a file. The results are shown in the Table and Figure below.

Table A1: (Integrated file-based Broadcasters' responses)

Outsourced Archive – who does what	Archive	Contractor	Other	Nobody
Number of backups	86%	0%	14%	0%
Backup storage methods	86%	0%	14%	0%
Backup checking	57%	0%	29%	14%
PERFORMS the checking	57%	0%	29%	14%
Storage hardware replacement	29%	29%	43%	0%
Storage system type	43%	14%	43%	0%
Low-resolution copies	57%	14%	29%	0%
File format obsolescence	43%	0%	43%	14%
ORGANIZES low-res recreation	43%	14%	14%	29%
PERFORMS low-res checking	43%	0%	14%	43%



(Experienced Broadcasters' responses)

According to the Broadcasters' responses, outsourcing is present in the following areas:

- Deciding, when storage hardware gets replaced.
- Deciding, what kind of storage system to use.
- Deciding, what kinds of low-resolution (access, proxy) copies are needed.
- Organizes remaking of new low-resolution files from master files.

Still, most of the processes are dominated by in-house services, carried out either by archive or other departments, as almost all processes need evaluation of the importance of the Content, for which you need to have the knowledge of the Content owner.

It is worth mentioning that some services are reported to be operated by nobody, e.g. two with the highest 'orphan' score are:

- Organizing the remaking of new low-resolution files from master files
- Checking low-resolution files, to ensure they have no problems

Vendors

Vendors reported the following results:

Table A2: (Vendors' responses)

Outsourced Archive – who does what	Archive	Contractor	Other	Nobody
Number of backups	100%	0%	0%	0%
Backup storage methods	60%	20%	20%	0%
Backup checking	80%	0%	20%	0%
PERFORMS the checking	60%	20%	20%	0%
Storage hardware replacement	20%	0%	80%	0%
Storage system type	20%	0%	80%	0%
Low-resolution copies	0%	40%	60%	0%
File format obsolescence	40%	0%	60%	0%
ORGANIZES low-res recreation	20%	20%	20%	40%
PERFORMS low-res checking	20%	20%	40%	20%

The results suggest less of a role for archive departments (but more other in-house departments) in some technology oriented decisions.

The case of the two orphaned areas was confirmed.

Annex B: Correlation between questionnaire and Report sections

A – Questions to inexperienced users.

B - Questions to experienced users.

§ – Section number in main body of this report.

Section Name – section name in main body of this report

A	B	Question	§	Section Name
		General Figures		
		Workflows		
2	8	In your organization, is the archive at the end of the operation or distributed across it?	3.1	Place, role and benefits of a file-based archive
3	9	A: What do you regard as the primary role of your future file-based archive? B: What do you regard as the primary role of your file-based archive?	3.1	Place, role and benefits of a file-based archive
4	10	What are the file-based archive benefits relevant for you?	3.1	Place, role and benefits of a file-based archive
	11	Which production areas/systems did you integrate first with your file-based archive?	3.2	Archive integration within the television production workflow
5	12	A: Which tasks would you like to change, after introducing a file-based archiving workflow? B: Which tasks have changed, after introducing a file-based archiving workflow?	3.3	Changing tasks
	13	To what degree has access to the archive been extended to non-archivists?	3.3	Changing tasks
6	14	A: What do you expect to be the biggest ORGANISATIONAL CHALLENGES for creating new file-based archiving workflows? B: What were the biggest ORGANISATIONAL CHALLENGES for creating new file-based archiving workflows?	3.4	Organizational challenges in implementing new workflows
	15	What are the top NON-organizational problems in implementing new workflows ?	3.5	Non-organizational problems in implementing new workflows
	16	What are your expectations/experiences regarding the opportunities and challenges that HDTV brings to file-based archiving WORKFLOWS?	3.6	HDTV's impact on archiving workflows
		Retention strategy		
7	18	A: Do you think your retention policy will change with the introduction of file-based archiving? B: Did your retention strategy change with the introduction of file-based archiving?	3.7	Retention strategy
	19	What material do you keep?	3.7	Retention strategy
8	20	Do you include non-finished (raw) material in the archive?	3.7	Retention strategy
9	21	Do you specifically archive your web content?	3.7.1	Archiving of web Content
10	22	What is/are the main selection criteria for archiving material?	3.7	Retention strategy
11	23	Who decides what is kept?	3.7	Retention strategy

A	B	Question	§	Section Name
	24	Do you also archive temporarily (e.g. for 6-18 months) in a dedicated "intermediate archive"?	3.7	Retention strategy
		Rights management		
12	25	A: How do you organise the management of 'usage rights'? By 'usage rights' we mean the rights to (for example) use material A in programme B. An answer could be "We try to minimize the number of different right contracts." B: First we refer to 'usage rights' (e.g. can I use material X in programme Y). What did you do to best organize managing 'usage rights' of your content?	3.8	Rights management
13		Are journalists / programme-makers (we mean: non-archivists) allowed / able to retrieve material completely independently? Example: beyond the office hours of the archive department.	3.3	Changing tasks
		Technology		
	27	What are the top technical problems you experienced? We would like to make a top 3 of technical problems experienced.	4.1	Technical problems
15	28	How important are the following strategic questions for you?	4.2	Technical questions: strategic
	29	Accounting of storage costs: Against whose resources is the yearly increase of archive storage capacity accounted?	4.9	Technical questions: storage costs
	30	What did you do to prepare your other systems for archive integration? What needed to be changed for each of the following?	4.3	Technical questions: preparation
	31	What did you do, in order to make your IT infrastructure ready for digital archive deployment (and integration).	4.3	Technical questions: preparation
	32	What other technology changes (should) have preceded digital archive deployment and integration?	4.3	Technical questions: preparation
16	33	A: Please select the integration levels you are planning to deploy. B: Please select the integration levels you deployed.	4.4	Technical questions: level of integration
17		Did you/will you have to integrate legacy files into your file archive?	4.8	Technical questions: migration
18		How did you/do you intend to migrate your legacy tapes?	4.8	Technical questions: migration
19		Which Amount of legacy tapes (hours) did you/do you intend to migrate in total for each of above categories (A, B, C and D)?	4.8	Technical questions: migration
		Formats		
21	34	A: What video formats have you specified for the essence that is to be archived? (576i/25, 720p/50, 1080i/25, etc.) B: What video formats have you specified for the essence that is archived? (576i/25, 720p/50, 1080i/25, etc.)	4.5.1	Video formats (Image Sampling Systems)
22	35	What compression formats have you specified? (DVCPRO, IMX, AVCI,	4.5.2	Compression formats
23	36	What wrappers/file formats have you specified? (AAF, MXF, QuickTime, ...)	4.5.3	Wrappers/file formats
24	37	What media formats have you specified? (data tape, optical disk, hard disk, …). Please indicate also if you still maintain video tape in addition.	4.5.4	Media formats
25	38	What media transport mechanism have you specified for use between the archive and production environment?	4.5.5	Media transport mechanism
26	39	What browsing formats have you specified? (MPEG-1, H.264, ...)	4.5.6	Browsing formats
27	40	Have you specified one file format (compression, wrapper) for a given resolution in your archive, or do you keep your archive	4.5.7	Number of file formats in production & archive

A	B	Question	§	Section Name
		collection in many (native) formats?		
28	41	Does your long-term archive allow you to store "Video Edit Projects" (which usually contain a proprietary structure of folders and files)? Example: project created in a graphics environment.	4.5.8	Storing 'Video Edit Projects'
29	42	Do/Will you hold different HD compression formats/variants/bitrates for different purposes in your archive? Which compression format/variant for which purpose?	4.5.9	Different HD formats for different purposes in the archive?
		Metadata		
	43	What B2B exchanges were you unable to do due to metadata issues, if any?	4.6.1	Metadata in business to business (B2B) Content exchange
30	44	What metadata standards for exchange (between archive and production) have you specified? Examples: P/META, Dublin Core based, etc.	4.6.2	Metadata standards for exchange between archive and production
31	45	What metadata standards for internal archive usage have you specified? Examples: P/META, Dublin Core based, etc.	4.6.3	Metadata standards for internal archive usage
		Storage		
33	46	A: Which storage media / technology will you be using for long-term storage? B: Which storage media and technologies do you use for long term storage?	4.7.1	Storage media and technologies used for long term storage
	47	Did you integrate all used storage technologies into a centralized archive management system?	4.7.2	Integrating storage technologies into a centralized archive management system
	48	How do you manage storage system failures (data corruption)?	4.7.3	Managing storage system failures (data corruption)
	49	Are archived files kept in the Online Storage for some time, in order not to have to retrieve them from tape again (Hierarchical Storage Management)?	4.7.4	Keeping archived files in the Online Storage (for some time), in order not to have to retrieve them from tape again. (Hierarchical Storage Management)
34		If you migrate to temporary file-based storage (such as disks) while waiting for online storage to become available, then please indicate the size of your temporary storage collection (IN HOURS).	4.8.4	Temporary file-based storage (while waiting for online storage to become available)
		Migration		
	50	How do you intend to/did or do you migrate your legacy tapes?	4.8.1	Legacy tape migration – manual vs. automatic
	51	Which Amount of legacy tapes (hours) did you/do you intend to migrate in total for each of above categories (A, B, C, D and E)?	4.8.2	Legacy tape migration – figures in hours
	52	Did you/will you have to integrate legacy files into your file archive?	4.8.3	Integrating legacy files into the archive
	53	If you migrate to temporary file-based storage (such as discs) while waiting for online storage to become available, then please indicate the size of your temporary storage collection (IN HOURS).	4.8.4	Temporary file-based storage (while waiting for online storage to become available)
	54	Does your Archive-Software check the quality of the archived files automatically?	4.8.5	Automatic quality check
	55	55. How many redundancies does your redundancy concept provide and what purpose do they serve (e.g. security, load balancing)?	4.8.6	Redundancies

A	B	Question	§	Section Name
		Answer how many times each file is stored and explain the concept(s), please.		
	56	56. If your technical setup includes special precautions against content loss in case of a large catastrophe, please specify which maximum catastrophe you have thought of and what are the precautions?	4.8.7	Maximum catastrophe of Content loss - presumptions and precautions
		Project management		
	57	What are the top 3 problems in running an archive system integration project?	5.1	Problems in running an archive system integration project
35	58	A: Will you follow an established project management methodology? B: Did you follow an established project management methodology?	5.1	Project Management methodology
	59	Was the archive project part of a larger programme?	5.3.1	Archive as part of a larger programme
	60	Was your project related to organizational changes?	5.3.2	Archive integration in relation to organizational changes
36	61	What procurement procedure(s) did you use?	5.3.3	Archive Project procurement procedures
	62	Did your project finish with delivering the expected product?	5.3.4	Delivery of an expected product
	63	Did your project finish with the planned time?	5.3.5	Delivering the product within the planned time
	64	Did your project finish with the projected budget?	5.3.6	Delivering the product within the projected budget
	65	Did you experience any unexpected integration errors? Example: where you aware you would be responsible for certain details later?	5.3.7	Unexpected integration problems
	66	Did the project include significant scope change(s)?	5.3.8	Significant project scope changes
	67	What advice would you give to broadcasters starting a new archive project?	5.3.9	Running an archive project – general advice
37	68	What measures do you regard most important for broadcasters to have a successful file-based archive integration project?	5.4	How could Broadcasters improve the result?
38	69	What measures do you regard most important for vendors to have a successful file-based archive integration project?	5.5	How could Vendors improve the result?
39	70	What measures do you regard most important for the EBU (or other external organizations) to help broadcasters have successful file-based archive integration projects?	5.6	How could the EBU (or other organizations) improve the result?
		Service levels		
40	71	For each of the following service levels you think important, please: enter a value you think is realistic:	6	Parameters for an archive system's service levels
		Outsourcing		
41	72	Is your organization using or going to use contracted services for long-term storage and preservation of content?	A 1.1	General figures
42	73	Which functions are going to be carried out by contracted services (specifically for long-term storage of media files)?	A 1.2	Outsourced services - preferences
	74	For the following delegated functions, please specify who does what. Backup copy is used simply to mean an extra copy of a file.	A 1.3	Outsourced functions – delegation