2023 Survey Summary for Storage in Professional Media and Entertainment

Thomas Coughlin
Coughlin Associates
www.tomcoughlin.com

Introduction

Digital storage plays a significant role in the professional media and entertainment industry. Digital storage for the M&E industry has demand characteristics often very different from typical IT storage because of the performance requirements of real-time video in capture, editing and post-production as well as distribution. On the other hand, the ever-growing archive of long-tail digital content and increasing digitized historical analog content is swelling the demand for cold as well as warm archives using tape, optical discs and hard drive arrays.

In February through June of 2022 and again in 2023, Coughlin Associates, Inc. conducted a survey of professional media and entertainment professionals on various digital storage topics. The survey was broken down into several segments: content capture, editing and post-production, content delivery as well as archiving and digital preservation. The Society of Motion Picture and Television Engineers (SMPTE), Broadcast Beat, Post Magazine, Postperspective.com and other organizations assisted by soliciting survey participants. Since at least 2012 our survey sources have included more small facility professionals than large facility professionals due to our additional outreach through our survey partners.

Coughlin Associates wished to conduct the survey in order to discover new trends for storage in the industry and improve the accuracy of the company's annual report on digital storage for the media and entertainment industry. This summary contains some of the results from that survey and where appropriate we will compare the 2022/2023 results from those of a similar survey in February to June 2021, January to Jun 2020, January to May 2019, January to May 2018, January to May 2017, February to June 2016, March to May 2013, 2014 and 2015; May and June of 2012; February, November and December of 2010 and March of 2009.

Note that in 2022 and 2023 of the 69 people that started the survey, 68 completed at least some part of the survey (98.6%). All of the people surveyed worked with professional media and entertainment content. 43 were involved in content capture, 45 were involved in digital editing or post-production, 14 were involved in content distribution and 31 were involved in long term digital archiving or digital preservation.

Table 1 shows the percentage of survey participants in various professional content market segments and **Table 2** show the general locations of the survey participants. Note that the "other" category in Table 1 mostly included responses such as sports, education, social media, documentaries, news, webinars, promotional work, religion and audio production.

The following sections of this document give some of the results of the survey for each of the major survey sections described above. Note that the results given in this survey are representative of the full data but they are often a simplification of the more complex survey results. The full survey, including a more complete analysis of the survey results as well as some multi-factor dependencies is available from Coughlin Associates as part of the 2023 Digital Storage in Media and Entertainment report (https://tomcoughlin.com/tech-papers/).

Table 1. Percentage of survey participants in content market segments.

TV Episodics	48.1%
TV Other	28.8%
Feature Film	32.7%
Short Features, Commercials and Trailers	38.5%
Corporate or Government Video	26.9%
Webcasts	15.4%
Games	1.9%
Other (please specify)	21.2%

Table 2. Survey participant locations.

US or Canada	69.2%
Mexico or Latin America	1.9%
Europe	23.1%
Africa	0.0%
Japan or Korea	1.9%
China or Rest of Asia	3.8%
Australia	0.0%
Antartica	0.0%

Content Capture

Professional video cameras are undergoing rapid evolution, driven by higher resolution content as well as multi-camera content capture, including stereoscopic virtual reality content capture. In addition, the physical storage media for professional cameras is undergoing continuing evolution as film and magnetic digital tape are impacted by the rapid file access convenience of hard disk drives, optical discs, and the ruggedness of flash-based solid-state storage.

Figure 1 shows the percentage of various recording media used by the 2022 and 2023 survey recipients in professional video cameras. Flash memory and HDDs dominated the responses, with nobody reported using Film, Optical Discs or Magnetic Tape. About 1% (0.7%) of the participants record directly to the cloud.

Figure 1. Percentage of recording media in professional video cameras.

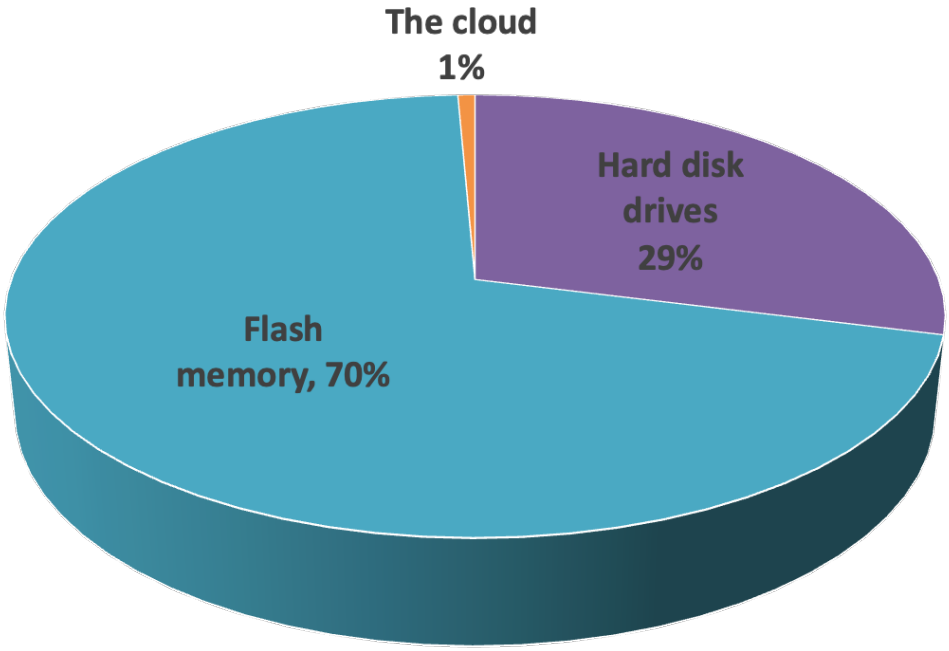


Table 3 compares the results from the 2009, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021 surveys with those from 2022 and 2023.

Table 3. Comparison of Professional Video Camera Media Trends

Year	Magnetic Tape	HDD	Optical	Flash Memory	Film	Cloud
2009	34%	23%	9%	19%	15%	
2010	25%	22%	17%	28%	8%	
2012	20%	22%	12%	44%	2%	
2013	15%	18%	7%	59%	1%	
2014	7%	24%	10%	57%	2%	
2015	4%	21%	8%	66%	1%	
2016	2%	34%	8%	54%	2%	
2017	5%	33%	3%	59%	0.16%	
2018	2%	35%	2%	56%	5%	
2019	1.1%	29%	1.2%	67%	1.3%	
2020	0.0%	34%	0.5%	62%	3.5%	
2021	0.4%	38%	1.7%	59.2%	0.6%	

2022/2023	0.0%	29.2%	0.0%	70.8%	0.0%	0.7%

Flash memory is the clear leader in professional video camera media, increasing from 19% in 2009 to 66% in 2015, 54% in 2016, 59% in 2017, 56% in 2018, 67% in 2019, 62% in 2020, 59% in 2021 and 70.8% in 2022/2023. Magnetic tape shows a consistent decline and in 2022/2023 there was no magnetic tape reported in the survey and in 2021 tape was less than 1%. Optical discs use between 2009 and 2016 bounced around between 7% and 17% and declined to 3% in 2017, 2% in 2018, about 1% in 2019, 0.5% in 2020, 1.7% in 2021 and 0.0% in 2022/2023. Film shows a general decline with 15% usage in 2009 to 2% in 2016, much less than 1% among survey participants in 2017, up to 5% in 2018, about 1% in 2019, about 3.5% in 2020, 1% in 2021 and 0.0% in 2022/2023. The trend with declining film use follows the trend towards completely digital workflows.

Note that about 58% said that they used external storage devices to capture content from their cameras in 2016, 60.7% in 2017, 59.6% in 2018, 58.0% in 2019 and 60% in 2020 as well as 2021 and 45% in 2022/2023.

In 2022/2023 about 97% of the survey respondents that participated in this section said they reuse their recording media (compared to 92% in 2021, 100% in 2020, 95.4% in 2019, 91.5% in 2018, 94.1% in 2017, 93.4% in 2016, 89.9% in 2015, 93.3% in 2014, 84.5% in 2013, 86% in 2012, 79% in 2010 and 75% in 2009).

In 2022/2023 about 68.0% of respondents said they archive their camera recording media (compared to 83.0% in 2021, 83.3% in 2020, 78.4% in 2019, 83.0% in 2018, 78.6% in 2017, 75.0% in 2016, 73.6% in 2015, 74.2% in 2014, 81.4% in 2013, 85% in 2012 and 77% in 2010).

Digital storage on tape, hard disk drives or flash storage allows reuse of media. It may be that more participants are copying their content onto a couple of media, where one is the archival media (this is likely based upon the percentage that reuse their recording media).

In the professional Media and Entertainment Survey we asked how much of the participants content was born digital and got the responses shown in **Table 4**. We included responses for the same ranges from the 2022/2023-2010 surveys. In 2022/2023 87.1% said that over 80% of their content is created in a digital format vs. 86.9% in 2021, 90.3% in 2020, 87.4% in 2019, 83.4% in 2018, 85.7% in 2017, 83.0% in 2016, 85.3% in 2015, 81.1% in 2014, 75% in 2013, 80% in 2012 and 63% in the 2010 survey.

Table 4. Survey Question: What % of your Content is Born Digital

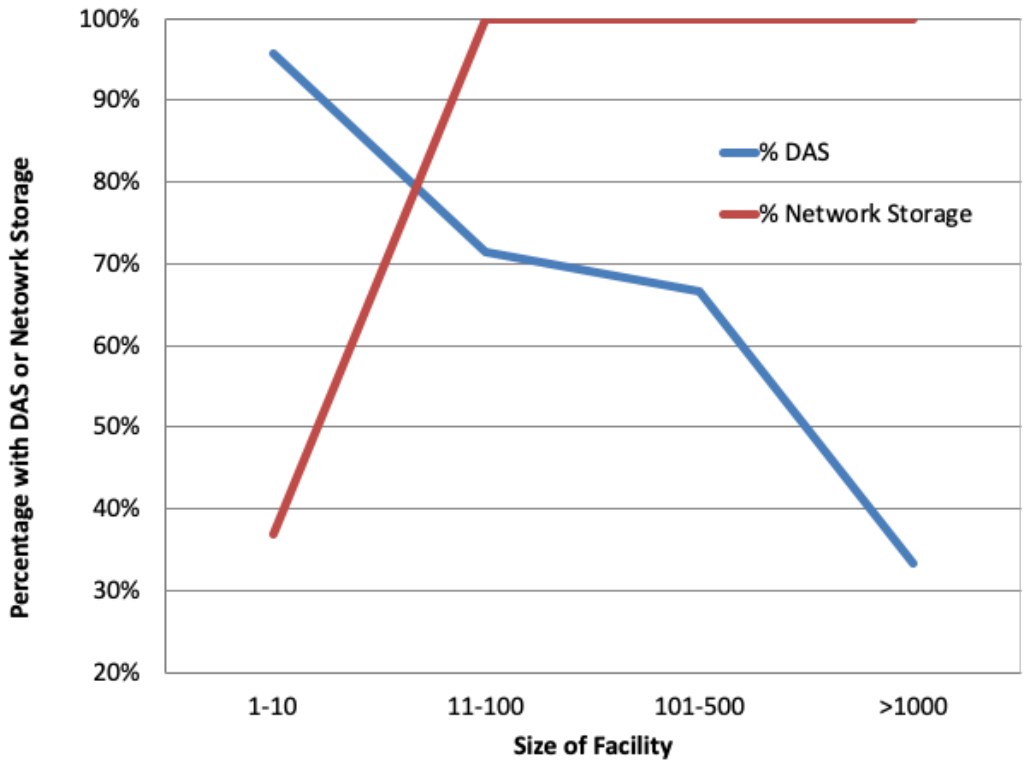
Percent Born Digital	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022/

												2023
<10%	3.9%	0.9%	1.1%	0.0%	0.0%	0.0%	1.2%	2.1%	0.0%	0.0%	0.0%	6.5%
11% to 20%	1.3%	0.4%	0.0%	1.1%	1.6%	3.4%	0.0%	2.1%	2.3%	3.3%	1.9%	0.0%
21% to 30%	3.2%	0.0%	0.0%	1.1%	1.6%	3.4%	1.2%	0.0%	0.0%	3.2%	0.0%	0.0%
31% to 40%	3.2%	2.6%	1.1%	2.1%	1.6%	0.0%	0.0%	2.1%	2.3%	0.0%	0.0%	0.0%
41% to 50%	5.2%	2.2%	3.3%	2.1%	0.8%	1.1%	3.6%	2.1%	2.3%	0.0%	1.9%	0.0%
51% to 60%	5.2%	1.7%	2.2%	1.1%	1.6%	3.4%	1.2%	0.0%	2.3%	0.0%	0.0%	0.0%
61% to 70%	5.8%	3.1%	6.5%	4.2%	1.6%	1.1%	0.0%	6.3%	1.1%	3.2%	1.9%	6.5%
71% to 80%	8.4%	8.3%	10.9%	7.4%	5.7%	4.5%	7.1%	2.1%	2.3%	0.0%	7.6%	0.0%
81% to 90%	16.1%	10.9%	15.2%	15.8%	7.3%	14.8%	13.1%	6.3%	11.3%	6.4%	7.6%	0.0%
91% to 100%	47.7%	69.9%	59.8%	65.3%	78.0%	68.2%	72.6%	77.1%	76.1%	83.9%	79.3%	87.1%

Digital Editing and Post Production

Figure 2 shows that for the 2021 survey participants there were a general increase in the use of shared network storage (such as SAN or NAS), and a decrease in DAS storage as the number of people working in a post-production facility increases. The DAS storage in the larger facilities may be different than that used in smaller facilities and it looks like DAS use in larger facilities only declines to about 35%. The 2022/2023 surveys were too small to give a good indication of this trend.

Figure 2. DAS vs. Shared Storage and Number of People in a Post Facility



When participants were asked about their use of direct attached and network storage in digital editing and post-production, the survey showed the following summary statistics in 2022/2023 (compared to earlier surveys):

- 53.0% had DAS in 2022/2023 (compared to 90.5% in 2021, 81.1% in 2020, 86.6% in 2019, 82.6% in 2018, 84.8% in 2017, 74.5% in 2016, 85.1% in 2015, 87.7% in 2014, 87.3% in 2013, 92% in 2012, 91% in 2009 and 83.8% in 2010)
  - 83.3% of these had more than 1 TB of DAS in 2022/2023 (compared to 87.3% in 2021, 85.7% in 2020, 89.3% in 2019, 81.0% in 2018, 86.7% in 2017, 89.8% in 2016, 89.1% I 2015, 86.5% in 2014, 88% in 2013, 78% in 2012, 96% in 2010 and 52% in 2009)
  - 1 to 50 TB was the most popular DAS size range (62.5%) in 2022/2023
  - 20.8% of these had more than 50 TB of DAS storage in 2022/2023 (compared to 14.6% in 2021, 17.9% in 2020, 11.8% in 2019, 12.1% in 2018, 18.7% in 2017, 17.4% in 2016, 18.5% in 2015, 22.3% in 2014 and 18.3% in 2013)
  - 0.0% had more than 500 TB of DAS storage in 2022/2023 (this was 0% in 2019-2021, 3.5% in 2018, 4.0% in 2017, 2.9% in 2016, 8.4% in 2015, 6.9% in 2014 and 7% in 2013)
  - Many survey participants were not using flash memory in their post-production DAS storage in 2022/2023 (47.4%). For those that did this was an average of 44.7%, up from 36% in 2021, 25% in 2020 and 7% in 2019)
- 77.3% had NAS or SAN in 2022/2023 (compared to 51.7% in 2021, 60.0% in 2020, 57.0% in 2019, 58% in 2018, 49.4% in 2017, 68.1% in 2016, 68.6% in 2015, 75.0% in 2014, 70.9% in 2013, 53.8% in 2012, 81% in 2010 and 2009—probably lower due to the addition of many smaller post-production facilities in the later surveys
  - 66.7% had 50 TB or more of network storage in 2022/2023 (compared to 48.4% in 2021, 55% in 2020, 45.6% in 2019, 57.5% in 2018, 65.8% in 2017, 57.4% in 2016, 52.1% in 2015, 49.4% in 2014 and 57.8% in 2013)
  - About 36.4% had more than 500 TB of NAS/SAN storage in 2022/2023 (this was 25.8% in 2021, 35% in 2020, 15.8% in 2019, 15.0% in 2018, 13.6% in 2017, 15% in 2016, 17% in 2015, 11% in 2013 and 2014)

Some survey participants had considerable storage capacities in both DAS and NAS/SAN.

In the 2012-2023 surveys we asked whether survey participants used cloud-based storage for editing and post-production. In 2022/2023 41.9% of responding participants said yes versus 32.3% in 2021, 50% in 2020, 45.6% in

2019, 47.5% in 2018, 41.9% in 2017, 23.0% in 2016, 30.2% in 2015, 25.6% in 2014, 24.7% in 2013 and 15.1% in 2012.

In 2022/2023 62.5% of the respondents said that they had 1 TB or more storage capacity in the cloud vs. 32.1% in 2021, 36.8% in 2020, 38.2% in 2019, 55.6% in 2018, 43.7% in 2017, 20.9% in 2016, 32.9% in 2015, 28.1% in 2014, 23% in 2013 and 26.7% in 2012. We believe that there a general trend to increased use of the cloud, driven by greater familiarity during the Covid pandemic and because it facilitates collaborative workflows.

Table 5 compared the 2009-2023 survey results for distribution media used for proxies or completed editing work. Note that in the 2023 through 2012 surveys we added proxy distribution through the Internet as a response option. In 2014 through 2023 we included USB Flash Sticks.

Analog and digital tape showed a relative decline over the years with no analog video tape reported in 2017 through 2023. Optical discs showed a significant drop in the 2022/2023 survey. HDDs have been fairly stable over the years ranging from 18-39%, although this was 54% in 2021. USB sticks were 22% in 2023. Internet distribution was 78% in 2022, 93% in 2021, 35% in 2020, 37% in 2019, 32% in 2018, 32% in 2017, 30% in 2016, 29% in 2015 and is now the dominant method for proxy distribution today (followed by HDDs, USB flash sticks and DVD discs).

Table 5. Proxy Distribution Media Trends

	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022/ 2023
Other	11%	17%	5%	5%	5%	4%	4%	3%	3%	3%	2%	7%	13%
Analog video tape	10%	6%	2%	2%	1%	2%	1%	0%	0%	0%	0%	0%	0%
Blu-ray discs	9%	11%	10%	12%	11%	8%	10%	11%	9%	9%	6%	24%	8%
Digital tape	24%	18%	11%	11%	8%	7%	5%	2%	6%	3%	4%	5%	5%
Hard disk drives	24%	25%	19%	22%	18%	20%	21%	18%	22%	20%	26%	54%	42%
DVD discs	23%	23%	24%	21%	17%	17%	16%	19%	14%	15%	13%	34%	18%
USB Flash Sticks					13%	13%	13%	15%	15%	12%	15%	44%	22%
Through internet	NA	NA	29%	27%	27%	29%	30%	32%	32%	37%	35%	93%	88%

Content Distribution

Distribution of professional video content uses many different channels. It can use physical media for getting content to digital cinemas or to consumers or it can be done electronically using broadcast, cable or satellite transmission; or through the internet or wireless networks. **Table 6** gives responses for the percentage of physical media used by the survey respondents for content distribution in 2022/2023-2010 (for the 7, 11, 7, 25, 17, 47, 27, 36, 35, 29, 82 and 62 respondents that used physical content distribution media in 2022/2023, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012 and 2010 respectively).

Note that these are the average for the survey population giving their percentage for each physical media and do not and should not be expected to add to 100%. Digital Tape, DVD discs, HDDs, and Flash Memory are the most popular distribution formats and digital tape has become much less popular.

Table 6. Average Percentage content on physical media for professional content distribution

Media	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022 2023
Digital tape	59%	34%	32%	20%	9%	33%	30%	55%	4%	14%	9%	14%
CD or VCD discs	13%	18%	23%	4%	6%	19%	30%	2%	12%	29%	9%	14%
DVD discs	48%	79%	67%	51%	63%	36%	66%	43%	52%	71%	64%	71%
Blu-ray discs	18%	24%	10%	21%	18%	12%	18%	12%	28%	43%	45%	57%
Hard disk drives	45%	51%	55%	52%	62%	64%	54%	56%	52%	71%	64%	43%
Flash or SSDs	25%	24%	22%	28%	24%	26%	31%	48%	52%	43%	55%	57%

Following are survey observations for electronic content distribution (such as video on demand).

- Average hours on central content delivery system were about 1,200 hours in 2022/2023. In 2021 this was 886 hours, compared to 4,445 in 2020, 1,849 hours in 2019, 1,241 hours in 2018, 3,214 hours in 2017, 2,174 hours in 2016, 4,182 hours in 2015, 1,142 hours in 2014, 2,275 hours in 2012 and 1,894 hours in 2013. It was 700 hours in 2010 and 200 hours in 2009). The number can get skewed upward by a few big facilities.
- There was an average of 475 hours ingested monthly in 2022/2023 (this was 287 hours in 2021, 632 hours in 2020, 114 hours in 2019, 372 hours in 2018, 296 hours in 2017, 427 hours in 2016, 492 hours in 2015, 688

hours in 2014, 837 hours in 2013, 500 hours in 2012, 200 hours in 2010 and 150 hours in 2009). The 2013 and 2014 data is skewed high by some very high survey participants.

- In 2022/2023 none of the respondents had more than 5% of their content on edge servers (this compares to about 21.0% in 2021, 22.2% in 2020, 31.4% in 2019, 42.8% in 2018, 35% in 2017, 38% in 2016, 43% in 2015 and 2014, 42% in 2013 and 24% in 2012)
- In 2022/2023 14.3% of the participants used flash memory on their edge servers (this was 20.0% in 2021,22.2% in 2020, 6.1% in 2019, 48% in 2018, 18% in 2017, 31% in 2016, 20% in 2015, 21% in 2014, 12% in 2013, 14% in 2012, 16% in 2010 and 20% in 2009)
- Note that in 2022/2023 28.6% of survey respondents said that they used flash memory in their central delivery servers (this was 21.0% in 2021, 44.4% in 2020 and 9.4% in 2019).

Digital Archiving and Preservation

Today most new entertainment and media content is born digital and it is natural that this content should be preserved in digital form. This requirement places new demands on format preservation for long-term digital archives as well as management and systematic format refreshes during the expected life of a digital archive. In addition, the cost of analog content digitization and preservation in a digital format has gone down considerably and many digitization projects are proceeding apace.

The growth of digital content archiving is swelling the amount of content available for repurposing and long tail distribution. It will also increase the amount of storage and storage facilities required to store these long-term professional content archives and increase the need for new tools to find, use and preserve these assets.

Following are some observations from the professional media and entertainment survey on trends in digital archiving and content preservation. The ease of capturing and storing digital content has encouraged many facilities and organizations to store more of their raw captured content and even copies of all their distribution formats.

Detailed results from the 2022/2023 survey are compared to the 2021-2009 surveys.

- 46.7% had >2,000 hours of content in a long-term archive in 2022/2023 (compared to 26.7% in 2021, 34.8% in 2020, 23.7% in 2019, 31.6% in 2018, 32.4% in 2017, 41% in 2016, 34% in 2015, 41.9% in 2014, 43.8% in 2013 and 18% in 2012—note that there were fewer big archives in the

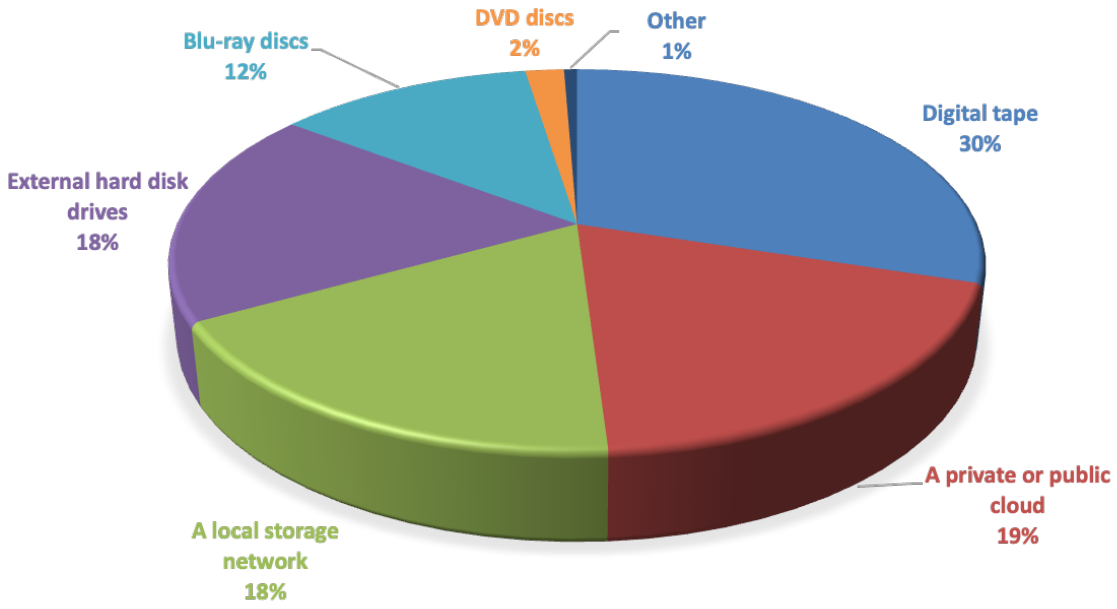
2017-2021 surveys compared to 2016-2013. This was 52% in 2010 and 44% in 2009,

- 60.0% archived all the content captured from their cameras in 2022/2023 (this was 73.3% in 2021, 68.2% in 2020, 76.7% in 2019, 52.8% in 2018, 61.3% in 2017, 56.9% in 2016, 57.6% in 2015, 46.5% in 2014, 48.6% in 2013, 63% in 2012, 34% in 2010 and 40% in 2009)
- 76.7% archived copies of content in all of their distribution formats in 2022/2023 (this was 75.6% in 2021, 81.8% in 2020, 70.0% in 2019, 75.7% in 2018, 67.7% in 2017, 54.0% in 2016, 62.6% in 2015, 69.4% in 2014, 56.9% in 2013, 71% in 2012, 57% in 2010 and 55% in 2009)
- 46.7% digitally archived all content captured from their dailies in 2022/2023 (this was 48.9% in 2021, 40.9% in 2020, 48.3% in 2019, 54.0% in 2018, 40.3% in 2017, 35.9% in 2016, 46.2% in 2015, 44.3% in 2014, 37.7% in 2013, 40% in 2012 and 24% in 2010)
- 36.7% digitally archived all content captured from rough cuts in 2022/2023 (this was 48.99% in 2021, 50.0% in 2020, 48.3% in 2019, 51.4% in 2018, 33.9% in 2017, 1.3% in 2016, 37.8% in 2015, 40.8% in 2014, 46.6% in 2013, 46% in 2012, and 23% in 2010)
- 23.3% digitally archived all content captured from their intermediaries in 2022/2023 (this was 42,2% in 2021, 50.0% in 2020, 36.7% in 2019, 37.8% in 2018, 27.9% in 2017, 36.5% in 2016, 37.4% in 2015, 38.6% in 2014, 46.3% in 2013, 8% in 2012 and 30% in 2010)
- 41.4% of the respondents said that their annual archive growth rate was >6% in 2022/2023 (this was 43.2% in 2021, 59.1% in 2020, 52.6% in 2019, 35.1% in 2018, 44.3% in 2017, 50.9% in 2016, 47.9% in 2015, 67.3% in 2014 and 65.3% in 2013).
- 19.9% added 1,000 hours or greater to their archive annually in 2022/2023 compared to 15.6% in 2021, 18.2% in 2020, 11.7% in 2019, 24.3% in 2018, 24.5% in 2017, 31.3% in 2016, 26.9% in 2015, 35.1 % in 2014, 34.4% in 2013, 9.3% in 2012 and 39% in 2010. (The 2012 results were probably due to the inclusion of many smaller producers)
- About 30.0% had >2,000 hours of unconverted analog content in 2022/2023 (compared to 8.7% in 2021, 33.3% in 2020, 8.4% in 2019, 18.8% in 2018, 18.2% in 2017, 28.6% in 2016, 32.6% in 2015, 33.3% in 2014, 24.2% in 2013, 18% in 2012, 54% in 2010 and 48% in 2009)
- In 2022/2023 10.0% of the participants had over 5,000 hours of unconverted analog content (this was 4,4% in 2021, 0.0% in 2020, 4.2% in 2019, 6.3% in 2018, 9.1% in 2017, 16.7% in 2016, 16.3% in 2015, 14.3% in 2014 and 3% in 2013)
- In 2022/2023 12.5% of the survey respondents have an annual analog conversion rate of 2% or less (compared to 43.5% in 2021, 44.4% in 2020, 54.1% in 2019, 56.3% in 2018, 39.4% in 2017, 52.5% in 2016, 42.8% in 2015, 21.5% in 2014, 27% in 2013 and 56% in 2012)
- The average rate of conversion is about 6.8% in 2022/2023 (this was 4.0% in 2021, 3.3% in 2020, 4.2% in 2019, 4.3% in 2018, 4.0% in 2017,

3.4% in 2016, 4.5% in 2015, 5.5% in 2014 and 5.4% in 2013). This is within the general range observed in 2012, 2010 and 2009).

Professional media and entertainment content has been traditionally archived on film or analog videotapes. Today the options available for archive media to store digital content depend upon the preferences and existing infrastructure of digital archive facilities. **Figure 3** gives the percentage distribution of archive media used by the survey participants.

Figure 3. Percentage of Digital Long-Term Archives on Various Media



Among the survey participants External HDDs were down from prior surveys at 18% in 2022/2023 compared to 25% in 2021, 40% in 2020, 48% in 2019, 54% in 2018, 40% in 2017, 23% in 2016, 28% in 2015 and 18% in 2014 (the similar category in earlier years was labeled Hard Drives and was 31% in 2013, 28% in 2012, 24% in 2010 and 25% in 2009).

Digital Tape was the most common storage media at 30% in 2022/2023 compared to 22% in 2021, 19% in 2020, 20% in 2019, 25% in 2018, 25% in 2017, 49% in 2016, 40% in 2015 and 2014, 43% in 2013, 23% in 2012, 36% in 2010 and 33% in 2009).

For the 2022/2023 through 2012 surveys, we added archiving in a private or public cloud and found that 19% used a public or private cloud in 2022/2023 versus 11% in 2021, 1.6% in 2020, 7.9% in 2019, 6% in 2018, 11% in 2017, 2% in 2016, 5% in 2015, 4% in 2014 and 2013 (and 5% in 2012).

Disk Local Storage Networks were 18% in 2022/2023, 23% in 2021, 26% in 2020, 14% in 2019, 8% in 2018 and 11% in 2017 (this was 16% in 2016 and 2015, 21% in 2014, 8% in 2013 and 12% in 2012).

Optical discs of all sorts were about 14% in 2022/2023 (compared to 18% in 2021, 11% in 2020, 9.6% in 2019, 7% in 2018, 11% in 2017, 8% in 2016, 6% in 2015, 12% in 2014, 8% in 2013, 28% in 2012, 21% in 2010 and 23% in 2009).

For the "other" category we had 1% in 2022/2023, 1% in 2021, 2% in 2020, 0.2% in 2019, 0.6% in 2018, 2% in 2017 and 2016 and 5% in 2015 and 2014 (compared to 6% in 2013, 4% in 2012, 19% in 2010 and 18% in 2009). Our survey looks like it is accounting for most of the archive media used by our survey participants.

We are guessing that in the earlier surveys archiving on local or remote network storage was a significant part of the "other" archive methods. Presumably many of the HDDs used for archiving are in arrays for warm (near-line) archives and that storage in a local network or in the cloud is likely on hard disk drives as well (making likely HDD archiving about 55% of the total in 2022/2023, 59% in 2021, 67.6% in 2020, 70% in 2019, 68% in 2018 and 62% in 2017.

Note though that there are LTO tape-based cloud storage systems using tape so the HDD number could be a bit lower. These numbers are abstracted from the actual response distribution since many facilities may use one or more archive storage media.

Table 7 gives the average projected growth rate for these archive storage media based upon the 2022/2023-2009 surveys. This data is a simplification of the complete results from the survey.

The growth rate of digital tape is much less than that of hard disk drives if we include external HDDs, local network storage and most of the cloud storage. Hard disk drives, either in local storage systems and devices or through network and remote storage appears to be having significant growth.

Note though that there are LTO tape-based cloud archives now available on the market, so actual cloud archive storage will likely be split between tape and HDDs. It is also clear from the survey that there is a segment of this market that will continue to rely on optical media for digital archives.

Table 7. Simplified percentage growth rate of various archival media types.

	2022 2023	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2010	2009
Digital Tape (%)	68.2	37.5	38.1	44.0	35.5	42.6	66.7	59.2	57.7	64.5	56.8	76.1	69.2
CD Discs (%)	18.2	5.0	23.8	18.0	9.7	14.9	21.7	17.1	12.5	12.9	20.1	56.6	63.5

DVD Discs (%)	18.2	17.5	28.8	28.0	22.6	25.5	28.3	26.3	18.8	21.0	34.5	32.7	32.7
Blu-ray Discs (%)	22.7	12.5	23.8	36.0	9.7	27.7	28.3	17.1	15.6	16.1	26.6	26.5	25.0
Hard Disk Drives (%)										48.4	69.8	21.2	26.9
Ext. HDDs (%)	36.4	70.0	52.4	76.0	71.0	59.6	50.0	55.3	42.4				
Local Network Storage (%)	54.5	22.5	42.9	36.0	22.6	29.8	43.3	35.5	39.1	29.0	24.5		
Private/Public Cloud (%)	40.9	25.0	28.6	32.0	29.0	25.5	28.3	30.3	23.4	19.4	17.3		
Other (%)	13.6	2.5	9.5	4.0	3.2	6.4	16.7	14.5	12.5	9.7	12.2	19.5	27.9

Some other observations from the archive and preservation section of the survey:

- About 35.7% never update their digital archives in 2022/2023 (compared to 36.4% in 2021, 28.6% in 2020, 40.7% in 2019, 44.4% in 2018, 37.5% in 2017, 41.6% in 2016, 46.4% in 2015, 25.4% in 2014, 42.4% in 2013, 44% in 2012, 39% in 2010 and 41% in 2009)
- 93.1% used different storage for archiving and working storage in 2022/2023 (this was 67.4% in 2021, 72.7% in 2020, 80.0% in 2019, 77.1% in 2018, 80.0% in 2017, 76.2% in 2016, 77.4% in 2015, 77.9% in 2014, 81.8% in 2013, 71% in 2012, 77% in 2010 and 75% in 2009)
- About 42.9% copied and replaced their digital long-term archives every 10 years or less in 2022/2023 (this was 54.6% in 2021, 61.9% in 2020, 51.8% in 2019, 50.0% in 2018, 60.7% in 2017, 49.2% in 2016, 45.2% in 2015, 67% in 2014, 47% in 2013, 50% in 2012)
- 62.1% said they would use a private or public cloud for archiving in 2022/2023 while this was 47.7% in 2021, 45.5% in 2020, 52.9% in 2019, 65.7% in 2018, 41.4% in 2017, 38.1% in 2016, 43% in 2015 and in both 2014 and 2013 40% said that they would use a private or public cloud for archiving content

Coughlin Associates

2023 Digital Storage for Media and Entertainment Report

The **2023 Digital Storage for Media and Entertainment Report,** from Coughlin Associates, provides ~256 pages of in-depth analysis of the role of digital storage in all aspects of professional media and entertainment. Projections are given out to 2028 for digital storage demand in content capture, post-production, content distribution and content archiving are provided in ~62 tables and ~129 figures.

You can find out more and order direct at https://tomcoughlin.com/product/digital-storage-for-media-and-entertainment-report/

You can also call us at 408-202-5098 or email us at tom@tomcoughlin.com.

ORDER FORM FOR THE 2023 DIGITAL STORAGE FOR MEDIA AND ENTERTAINMENT REPORT (PDF)

NAME: _____
TITLE: _____
COMPANY: _____
ADDRESS: _____
CITY: _____ STATE: _____
ZIP: _____
TELEPHONE: _____
FAX: _____
E-MAIL: _____

☐ Single User License $7,500

☐ Visa ☐ Mastercard ☐ American Express

Credit Card Number: _____
Expiration Date: _____
Signature: _____

Make checks payable to: Coughlin Associates
Mail to 1665 Willowmont Ave., San Jose, CA 95124
Telephone: 408-202-5098 Fax: 866-374-6345
Order On-Line at: https://tomcoughlin.com/tech-papers/

About the Author

Tom Coughlin, President, Coughlin Associates is a digital storage analyst as well as a business and technology consultant. He has over 40 years in the data storage industry with engineering and management positions at several companies.

Dr. Coughlin has many publications and six patents to his credit. Tom is also the author of Digital Storage in Consumer Electronics: The Essential Guide, which is now in its second edition with Springer. Coughlin Associates provides market and technology analysis as well as Data Storage Technical and Business Consulting services. Tom publishes the *Digital Storage Technology Newsletter, the Media and Entertainment Storage Report*, the *Emerging Non-Volatile Memory Report* and other industry reports. Tom is also a regular contributor on digital storage for Forbes.com and other blogs.

Tom is active with SMPTE (Journal article writer and Conference Program Committee), SNIA (including a founder of the SNIA SSSI, now CMSI), the IEEE, (he is President Elect of the IEEE in 2023, Past President of IEEE USA, Past Director for IEEE Region 6, and active various IEEE Societies) and other professional organizations. Tom is the founder and organizer of the Storage Visions Conference (www.storagevisions.com as well as the Creative Storage Conference (www.creativestorage.org). He was the general chairman of the annual Flash Memory Summit for 10 years and is currently the Program Chair. He was also an adjunct professor in Electrical Engineering at Santa Clara University. He is a Fellow of the IEEE and Past Chair of the Consultants Network of Silicon Valley (CNSV). For more information on Tom Coughlin and his publications and activities go to www.tomcoughlin.com.

