Electronic Information and Media

Objectives

At the end of this chapter you should be able to:

- describe why electronic information and media don't last;
- describe what can be done to make electronic information and media last longer;
- choose from the available options; and
- set up a preservation program for electronic information and media.

Introduction

Increasingly, museums, galleries and libraries are using electronic media to improve access to their collections, to enhance their documentary collections, as publishing options and as exhibits. As the interest in, and use of, electronic media increases, people are becoming more concerned about preserving these formats.

The main carriers, or media, for electronic information are hard disks, floppy disks, audio tapes, video tapes and CD-ROMs. Preserving electronic information and media is about being able to use them for as long as you want to. However, preserving electronic media is not straightforward. There are two main issues to consider:

- the preservation of the actual item, that is, the CD-ROM or the audio tape; and
- preserving the information.

When it comes to preserving electronic information and media, conservators tend to believe that preserving the information is more important than preserving the media. There are many reasons for this. One of the main ones is the recognition that technology is advancing at such a rate that many of the media used today may be obsolete in the near future. Think about how quickly compact discs—CDs—replaced the once familiar vinyl LP record.

Obviously, if you have invested in a certain technology you will want to protect your investment and be able to use your electronic media for as long as possible. This will require that the carrier and the machine needed to access the information are in good condition. This section gives basic information on caring for electronic media—with an emphasis on video and audio recordings.

Electronic information is inherently short-lived and at some stage the information will need to be transferred from its present carrier to a new carrier, before the present medium deteriorates or your equipment stops working. This may be in a few years or a decade, but you must plan for this transfer to take place.

In the meantime, this section will help you to care for your electronic media. If you are particularly interested in preserving electronic media, it is strongly recommended that you keep in touch with the latest developments—the library network can help you with this.

Considerations for preserving information in electronic format

Some of the information in archives, libraries and museums is already in electronic format. Most of this information is in analogue format, including audio recordings and video recordings on magnetic tape. Digital magnetic media such as floppy disks, hard disks and magnetic data tape are also being used. This will change as digital recording becomes more widely used.

Preserving electronic information and media is about:

- recognising that electronic preservation raises challenges that are fundamentally different than those encountered in preserving traditional-format materials such as paper and books;
- understanding why access to all magnetic information is going to be short-term;
- setting priorities by choosing what information to keep, and discarding the rest;
- using commonsense techniques to try and make electronic information and media last longer; and
- applying this knowledge systematically.

Magnetic recording—a brief history

The basic principles of magnetic recording were first discovered in the 1890s. Not much was done with the discovery because the necessary electronics hadn't been invented.

Audio recordings on tape were invented in the early 1930s and introduced to the domestic market in the late 1940s.

Several companies tried to develop a videotape recorder in the early 1950s, but Ampex was the first to succeed in April 1956.

The first on-air broadcast of videotaped material occurred on 30 November 1956, with the CBS Douglas Edwards evening news broadcast.

In 1968, Sony introduced the first videotape recorder that was small enough and cheap enough for use in education. It was replaced by the Sony U-Matic cassette recorder in 1971 which was still in use 25 years later.

The videotape recorder was not cheap enough for the consumer until Sony introduced the BetaMax in 1975. In 1976, JVC introduced the VHS VCR, and the battle of the formats began. In 1989, Sony introduced the Hi8 camcorder.

Digital videotape recording started in 1987 when the Society of Motion Picture and Television Engineers established the D1 standard. Digital has a major advantage over the previous analogue-based recorders, because there is no degradation when tapes are copied.

Since the introduction of the D1 format, at least four others have been launched. None of them dominates the market and D1 itself is now virtually obsolete.

Magnetic recording technology

All magnetic tape media consist of three components:

- ferromagnetic recording material, capable of being magnetised when placed in a magnetic field;
- substrate or base material, on which the recording material is coated; and
- a binder which functions as a carrier for the recording material, and bonds it to the substrate.

The magnetic materials used in audio recordings and video recordings are properly described as ferromagnetic. They are characterised by strong, easily detectable, spontaneous and permanent magnetisation—even without an external magnetic field.

Audio information, for example, speech or music, is recorded in the magnetic layer as a continuously varying analogue sound signal. The magnetic signal is made by an electromagnet, which conveys variations in electrical strength from the output of a microphone to the recording medium. On playback, the original sound is reproduced by reversing the process and replacing the microphone with a loudspeaker.

Video information, for example, the moving images filmed at weddings or on holidays, is recorded in the magnetic layer as a continuously varying analogue signal. Sound information on videos is recorded in the same way, but only in narrow tracks along the edges of videos.

The magnetic signal is made by a magnetic field. It can be erased deliberately when a new recording is made. But it can also be altered accidentally by a magnetic field that gets close enough to the recorded signal to alter it.

If magnetised material gets hot enough, the magnetism disappears. The point at which this occurs varies with the recording material. For example, with iron alloys it is 770°C.

Recording materials

The International Electrotechnical Commission—IEM—classify audio tapes into three types: Types I, II and III. A tape's classification is determined by the recording material used.

The gamma form of ferric oxide, iron rust, is the most widely used recording material. It is the recording material for audio cassettes designated as Type I. They are typically described as normal bias tapes.

Chromium dioxide was introduced in the late 1960s as a magnetic material suitable for high-density recording. These are known as IEC Type II—high bias—audio cassettes.

Pure iron particles, the recording material used by so-called metal media, are used in IEC Type III audio cassettes and digital audio tape—DAT—cassettes. They support recording densities approximately three times stronger than gamma ferric oxide particles.

Substrates

With magnetic tapes, the substrate is typically plastic film.

The base materials of early magnetic tapes, some of which may be stored in libraries and archives, were composed of cellulose triacetate or polyvinyl chloride—PVC.

Substrates of newer magnetic tape invariably consist of polyethylene teraphthalate—PET—which is often identified by one of its trade names, such as Du Pont's Mylar or Eastman Kodak's Estar and is known in the film industry as polyester. Compared with earlier substrate materials, PET films are stronger and more resistant to high temperatures and humidity.

Binders

Early magnetic tapes featured polyvinyl chloride—PVC—binders. Today, polyethylene binders are commonly used. These binders don't stand up well to high humidity which softens the binder. If the binder has softened to the extent that the particles either move or come right off the base, permanent damage will have been done to the recording. In a dry environment, it is possible that the binder may be re-hardened by reverse hydrolysis to get the sound back.

How long will audio and video recordings last?

The life of a recording is difficult to predict, and opinions vary.

The oldest audio recordings stored in archives are still playable after 40-50 years; and the oldest video recordings stored in archives are still playable after 30 years.

This potential lifespan is reduced considerably if recordings are not made, stored or used with preservation in mind.

In extreme humidity, deterioration can occur in a few years.

Remember that, even when tapes remain playable, the equipment to play them on may no longer exist.

For more information

For more information on the adverse effects of fluctuations in and extremes of relative humidity and temperature, please see *Damage and Decay*.

Keeping tapes playable

One way to keep tapes playable is gentle use on well-maintained equipment.

Gentle use:

- helps avoid changes in the magnetic signal known as print-through;
- re-tensions—but does not over-tension—tapes;
- gives early warning of physical and chemical deterioration; and
- checks whether recordings and equipment are still working together.

Why don't audio and video recordings last forever?

Recordings are short-lived because of:

- damage from inherent media instabilities;
- damage from various external conditions and events;
- inadvertent erasure;
- print-through effects, that is, changes in the magnetic signal, and wear that can render recorded signals unusable;
- physical damage from careless handling or improperly adjusted equipment;

- contaminants which can cause signal drop-outs;
- inappropriate storage environments, which cause significant chemical damage through hydrolytic degradation of binder materials; and
- equipment obsolescence because the usability of recordings on tape is dependent on complex technology.

Preserving audio and video recordings on tape

Preserving audio recordings and video recordings on tape in archival conditions is not yet fully understood—not as well understood as the archival preservation of paper.

Preserving recordings depends on:

- making a long-lasting recording at the beginning;
- looking after the magnetic signal;
- looking after the binder layer and the carrier layer;
- looking after the equipment used in recording and playing recordings during storage and use; and
- careful and systematic management.

Making recordings with preservation in mind

A good place to start preserving audio recordings and video recordings on tape is with the selection of long-lasting media before a recording is made.

When making recordings, use new tape, and use the highest quality recording media that you can afford. Major brand-name tapes from audio and VCR equipment manufacturers or magnetic products manufacturers are generally of a consistently good quality.

For important recordings, make two copies on tapes drawn from different manufacturing batches.

Comply fully with specifications established by the manufacturer on which the media will be recorded or played.

If you are in the north of Australia in summer or the south of Australia in winter, allow time—about one hour—for your video camera and video tapes to warm up or cool down before use. A rapid change from an air-conditioned room to tropical heat and humidity in the northern summer, or from a heated room to the cold and damp of a southern winter environment, can clog video heads and jam video cassettes.

Looking after the magnetic signal

Magnetic recordings on tape are made and destroyed by strong magnetic fields—such as the permanent magnets in headphones and loudspeakers. The situations and equipment to watch out for are:

- high-voltage power lines;
- lightning arresters in large buildings;
- magnetic flashlights;
- fridge magnets;
- small headphones; and
- speaker cabinets.

You will usually not have to worry about damage from normal household wiring and security scanners and X-ray equipment.

Follow the guidelines below and copy old, fragile or extremely valuable recordings if you listen to them frequently. Copying is known as dubbing.

Before copying, carefully rewind two or three times any tape which has not been used for several years. Careful rewinding relieves any tension in the tape, and reduces the effect of print-through.

Consider using electronic filtering when older recordings are being dubbed onto a new copy. Filtering can sometimes be effective in removing unwanted noise and the effects of wear or damage. Clearly label the original recordings and the copies.

Throw out all damaged tapes after copying them. A damaged tape can damage your equipment and this can damage the rest of your tapes.

Storing and maintaining tapes so they will last

Heat and high humidity are the two greatest enemies of audio and video tapes in storage.

Ideally, store video tapes in an environment where temperature is constant and in the range 18-24°C and where relative humidity is constant and in the range 35-45%.

For more information

For more information about the steps you can take to control relative humidity and temperature, please see *Damage and Decay*.

Achieving these conditions can be difficult, but the following steps will protect your tapes, even when the conditions are not ideal.

Store tapes in an environment that is slightly cooler and drier than is comfortable for humans, in a clean atmosphere and in polythene bags.

Fast-forward and rewind the tapes before storage—make sure that the tapes are correctly wound inside the cassette.

Protect tapes from rapid fluctuations in relative humidity and temperature.

Keep tapes out of direct sunlight and away from local heat sources.

Shelve tapes upright in sturdy shelves with dividing supports every 100mm-150mm. Vertical storage is preferred to horizontal storage, because storing the containers this way helps prevent damage to the edge of the tape.

If several containers are stacked horizontally on top of each other, the plastic cassettes can warp and the player may not accept the tape.

Play tapes to the end, leaving the tape wound smoothly, with only leader or unrecorded tape exposed.

Play tapes through every few years to check their condition and to minimise any tendency for layers to stick together or to print through magnetically.

For reel-to-reel tapes, the hubs used for storing tapes should be smooth and rigid; and tapes should have their ends fastened.

Label cassettes correctly.

Make sure the tape recorder or VCR works before you insert a tape.

CAUTION:

Avoid storing your tapes:

- directly on concrete floors because they are susceptible to spills and water damage, and high humidity;
- in attics or cellars where it is often very hot and the relative humidity is high;
- near bathrooms and laundries or other steamy, damp areas; and
- next to the VCR in an enclosed cabinet because it can get very hot.

Handling tapes to avoid damage

Audio recordings and video recordings need to be handled carefully, to avoid physical damage and contamination. Even when your hands appear clean, traces of sweat and oil are present, which can attract dust or promote mould growth when deposited on a recording.

Handle magnetic media carefully, avoiding skin contact with magnetic surfaces—handle the cassette only.

Prohibit eating, drinking and smoking in all areas where magnetic media are used or stored.

Carry reel-to-reel tapes by the hub or centre.

Don't carry your video camera or video tapes in a bag with liquids or food that could damage the video materials.

If the materials are being used outside of the archive, library or museum, provide staff and users with specific instructions.

For more information

For more information on the adverse effects of dust and mould, please see *Damage and Decay*.

Looking after equipment

Clean and adjust all recording and playback equipment regularly according to the manufacturer's instructions, making sure that the recordings themselves are clean.

Clean heads and guides, rollers and other components in the tape path with a swab of isopropanol—rubbing alcohol.

CAUTION:

Use cleaning tapes only as a last resort. Some types can cause premature head-wear or damage. Two types of cleaning tape are available. It is preferable to use the wet type rather than the dry, abrasive type.

Copying

Copying audio and video recordings on tape is an essential routine aimed at:

- preventing damage to originals through handling and playing;
- providing security copies, in case the originals are damaged or stolen; and
- ensuring the permanent preservation of recordings as the original carriers deteriorate.

Transfer important recordings to the latest available mainstream technology every five years or so—one source states every two or three years—to check the playability of the recording and to make sure it can be played on easily available equipment.

Make one recording per tape. Choose good-quality, polyester-based, ferric oxide-coated, standard-play, magnetic tape. Record in analogue mode.

Develop a standard procedure and make a written record of each tape copied—so that all copies will have uniform and predictable characteristics.

Do not use spliced tapes.

Leave the first two metres of each copy tape blank.

Precede each audio recording on a copy tape with a spoken announcement, giving the reference of the original, the numerical reference of the copy and a brief description of the item.

If you have a problem related to the care of electronic media, contact a conservator. Conservators can offer advice and practical solutions.

For further reading

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Preserving video recordings

Association for Moving Image Archivists—AMIA-L List server. To subscribe send an email message to listserv@ukcc.uky.edu with the following text as your message:
"subscribe AMIA-L first-name family-name".
For example: 'subscribe AIMA-L Alan Howell'
Important: Do not put any other text in the subject or cc message boxes.

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Preserving digital information

The Commission on Preservation and Access WWW home-page contains several reports on preserving digital information. Their URL is http://www-cpa.stanford.edu/cpa.html

Conservation Online WWW home-page http://www.palimpsest.stanford.edu/

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Self-evaluation quiz

Question 1.

Which of the following issues must be taken into account when considering the preservation of electronic media?

a) The preservation of the actual item, that is, the CD-ROM or the audio tape versus the preservation of the information.

b) Recognising that electronic preservation raises fundamentally different challenges than the problems encountered in preserving traditional-format materials such as paper and books.

c) The fact that technological advances will make the media obsolete.

d) Binders and substrates are adversely affected by high humidity conditions.

e) All of the above.

Question 2.

Which of the following statements are true?

a) The life span of a recording is difficult to predict.

b) The potential lifespan is reduced considerably if recordings are not made, stored or used with preservation in mind.

c) Video and audio recordings are best kept in conditions of high humidity.

d) Gentle use re-tensions, but does not over-tension, tapes.

Question 3.

When making recordings with preservation in mind:

a) use whatever tapes you can, to ensure that costs are kept low;

b) make two copies on tapes drawn from different manufacturing batches for important recordings;

c) comply fully with specifications established by the manufacturer on which the media will be recorded or played;

d) use new tape.

Question 4.

Which of the following statements are false?

a) Heat and high humidity are the two greatest enemies of audio tapes and video tapes.

b) The recommended storage conditions for video tapes are: temperature in the range 24-28°C and relative humidity in the range 35-45%RH.

c) It is recommended that you fast-forward and rewind the tapes before storage, ensuring that the tape is correctly wound inside the cassette.

d) Vertical storage is preferred to horizontal storage, because storing the containers this way helps prevent damage to the edge of the tape.

Answers to self-evaluation quiz

Question 1.

Answer: e).

Question 2.

Answer: a), b) and d) are true. c) is not true. In extreme humidity the lifespan of recordings is reduced significantly—deterioration can occur in a few years.

Question 3.

Answer: b), c) and d) are correct. a) is wrong. You should use the highest—quality recording media that you can afford.

Question 4.

Answer: b) is false The recommended storage conditions for video tapes are temperature in the range 18–24°C and relative humidity constant and in the range 35–45%RH.

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