

It is important to have an understanding of the various media for storage because they require different software and hardware equipment for access, and have different storage conditions and preservation requirements. They also have varying suitability according to the storage capacity required, and preservation or access needed.

Although it is very easy to focus on the traditional conservation of the physical artefact, it is important to recognise that most electronic media will be threatened by obsolescence of the hardware and software to access them. This often occurs long before deterioration of media (which have been subject to appropriate storage and handling) becomes a problem. However, appropriate selection, storage and handling of media is still essential to any preservation strategy (see [Storage and Preservation](#) ).

Obsolescence of previous storage media has occurred in rapid succession. In floppy disks alone we have seen a progression from 8 in to 5.25 in and then 3.5 in formats, with each change leading to rapid discontinuation of previous formats and difficulty in obtaining or maintaining access devices for them.

Mass storage devices have a long history and this section deals only with the magnetic and optical storage media which are in widespread or recent use. An interesting historical account of "new media" can be found in the PRO Preservation Guide series ( [Farley 1999](#) ).

### **Magnetic media**

Consist of a variety of magnetic media and containers including a range of magnetic tapes (e.g. reels, cartridges and cassettes) and disks (e.g. hard disks, floppy disks). They all utilise the magnetic properties of metallic materials suspended in a non-magnetic mixture on a substrate or backing material.

This provides a versatile and cheap storage medium and both the storage capacity and the ability to retain the magnetic charges holding the data have increased substantially in recent years. The method of construction and storing the data also point to potential weaknesses of magnetic media.

You should ensure appropriate storage away from strong magnetic fields as these may alter the media and lead to data loss (e.g. electrical equipment and motors). Damage from magnetic fields is rare and the media normally has to be in very close proximity (<50 mm) for this to occur. Tape enclosures or packing with a space clearance of 50 mm around the media is recommended for use during transportation and transfer.

Clean operating conditions and environments will reduce the scope for damage to media and devices. The high density of storage and the close proximity of device heads to the media mean even small particles such as smoke or other debris can lead to data loss.

Handling and use of magnetic storage media should be minimised to reduce wear, or refreshment cycles implemented (as recommended by the manufacturer) to replace media on a more frequent basis reflecting the levels of use.

Poor environmental storage may also lead to oxidation of the ferromagnetic material or problems with the "binding" layer or substrate materials. Recommendations for the storage environment of magnetic media are provided in [Storage and Preservation](#) .

Magnetic media are constantly evolving and in addition to fundamental changes in devices manufacturers often undertake an almost constant evolution of production processes. Although the reliability of magnetic media has improved over recent years it is important to be aware that faults in manufacture can occur and to make appropriate checks of new media when purchased. Media should also be of high quality and purchased from reputable brands and suppliers. As an additional safeguard archive copies can be made to comparable magnetic media purchased from different suppliers to guard against faults introduced into products or batches of the product by the manufacturers.

In addition to the magnetic media themselves it is important that attention is paid to the recording and access devices such as tape drives. These should be of good quality and well-maintained. Problems with the access devices e.g. head/media crashes are one of the most common cases of damage to magnetic storage media. It may also be desirable to write archive copies from different devices and software to protect data from malfunctioning devices or software.

### Optical media

Optical storage media such as CD-ROM (Compact Disc - Read Only Memory), CD-R (Compact Disc -Recordable), and DVD-ROM (Digital Versatile Disc - Read Only Memory) use laser light to read from a data layer. In CD-ROM this data layer consists of a series of pits and plateaux in a metallic coating over a plastic disk. A clear acrylic coating is applied to the metallic layer to protect it from scratches and corrosion. CD-R employs a dye layer which is light sensitive as the data layer. Data is written to and read back using laser light. The use of light sensitive dyes means CD-Rs are less stable than CD-ROMs and more concerns have been raised over their use as archival media ( [Ross and Gow 1999](#) ). As with magnetic media there is considerable diversity in

practice and production of CD-R and greater care is needed in selecting high quality media from reputable suppliers for archival purposes. DVD-ROM is a more recent optical storage medium with capacity to store 4.7-18 Gb.

Optical disks are an increasingly popular method of storage. The device reader is not in contact with the disk and mechanical failure is less likely to lead to data loss than damage to the disk itself through poor handling or storage. Disks should not be flexed or their surfaces marked or abraded e.g. through use of a sharp pen or pencil for labelling. The manufacturer's recommendation for marking should be followed.

As with magnetic media, optical media have been subject to a constant process of evolution and changes in manufacture. The quality of the media, a reputable source, and appropriate handling and storage environment (see [Storage and Preservation](#) ) will all affect its longevity.

### Media life

Media should be refreshed on a regular cycle within the lifetime for archival storage identified by the manufacturer or independent sources such as the US National Media Laboratory. Sample generic figures for lifetimes of media under various temperature and humidity levels assuming optimal use (no or very infrequent access) and environmental conditions (stable and free of

contaminants, u-v light and strong magnetic fields) are given in the figure below. It should be noted that the life of specific media will be dependent on the quality of manufacture. Media life will vary between specific products and dates (e.g. the earliest CDs will be more experimental in manufacture than current versions; branded "Gold" CDs will have longer life than cheaper standard products).

Figure 7

Sample Generic Figures for Lifetimes of Media

Device		25RH		
10 °C	30RH			
15 °C	40RH			
20 °C	50RH			
25 °C	50RH			
28 °C				
D3 magnetic tape	50 years	25 years	15 years	
DLT magnetic tapecartridge	75 years	40 years	15 years	
CD/DVD	75 years	40 years	20 years	
CD-ROM	30 years	15 years	3 years	

After [Dollar](#) , [NML](#) and [PRO](#)