Surviving the Sands of Time:
the challenge of preserving digital cultural objects

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Abstract

One of the primary aims of the Digital Silk Road project is to assist the preservation of Silk Road heritage objects. Is this aim realistic? This paper will compare the requirements for the survival of tangible objects with those for the survival of digital ones. Preservation of digital assets presents difficult problems, and it is presently receiving considerable attention internationally. Some issues are discussed, and some of the recommended preservation measures will be summarised.

Keywords
digital_preservation conservation heritage culture

1 Introduction

One of the themes of the Silk Roads conference is that digitisation can assist the preservation of real cultural heritage objects. In some ways it can. However, we must remember that actual objects have come down to us over millennia. Digital objects themselves have extremely exacting requirements for technology, infrastructure, skills, and continual management. It is doubtful that digital objects can realistically be expected to outlast actual ones, and we should ask ourselves whether creating digital images of them will add to the problem of preservation, rather than solving it. Digital imaging has many uses and benefits, but I shall argue that we must not let these distract us from the tasks of preserving the actual objects themselves.

Digitisation can help us achieve wonderful things. For example we can digitally reunite parts of manuscripts or objects that have been separated across the world. We can enable people worldwide to appreciate and enjoy beautiful things that otherwise would be hidden in archives or museum stores. High quality images, whether physical or actual, may be our only record of cultural objects and structures that have vanished or been destroyed - and sadly this will always happen. Digital imaging can show us hidden aspects of objects. Many objects are too delicate to survive much physical handling, and by using digital surrogates scholars can study them without damaging them – and work the other side of the world from the real collection. We can make as many copies of digital images as we like, each one as perfect as the first, and

transmit them around the globe.

Very large capital investments are being made in digitisation worldwide, and yet we don't understand very well at present how to go about preserving digital cultural objects. But several organisations are working on this, and some useful basic principles have been developed.

2 The Time Tombs: a story

The author, JG Ballard, has written a science fiction story entitled *The Time Tombs*. Set two or three thousand years in the future, this is a familiar tale of robbers breaking into tombs in the desert. Instead of stealing real treasures, they are hunting virtual images of the people buried in the tombs - reels of tape that play back automatically when the tomb is entered to make a virtual reality 'ghost' of the buried person appear. The robbers take the reels of tape, and I suppose the machines as well, because they can sell them on the art market.
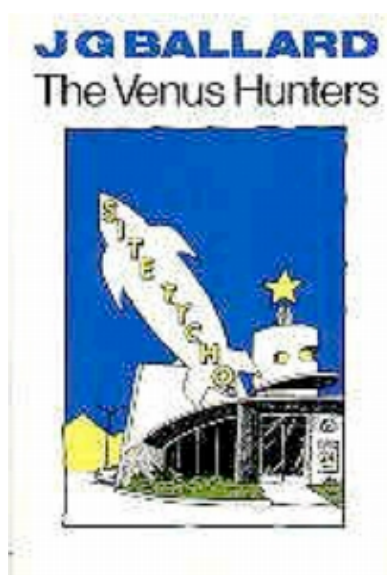

Fig.1 JG Ballard's book containing the story,

The Time Tombs

This story builds on our knowledge that actual objects can survive in the right conditions for thousands of years - in the deserts of Egypt or indeed of Afghanistan. But what about digital objects?

3 Actual objects - conditions for survival

There are four major factors that influence the long-term survival of actual, tangible objects.

Factors intrinsic to the object
It helps if the object is valuable, or if it is bulky and durable rather than made of delicate organic materials.

Factors relating to the ownership of the object
Powerful, permanent organisations such as monasteries, royal or aristocratic dynasties, governments, or even perhaps museums, tend to ensure that objects they own survive.

Social / political factors
As we know, political instability and conflict can result in the destruction of many wonderful cultural objects.

Physical factors
If the object is in a physically protected place, with a favourable and stable environment, such as a cave or a tomb or even underground, then its chances of survival can be very good.

We might also reflect that, sadly, many objects survive best if they are undiscovered by us.

4   The survival of digital objects

Are these factors relevant to the survival of digital objects? Can we hope to create the conditions for digital objects to survive as long as actual ones, or longer?

All four of the issues that are important for the survival of actual objects are obviously relevant to digital ones. They certainly illustrate some of the difficulties. Digital objects do not have a physical existence, of course, but they have to reside on physical media. Electronic chips and magnetic and

Fig.2 The Bezeklik Grottoes in the Flaming Mountains near Turfan. (Photo: Oliver Wild)

optical media are some of the most difficult materials to preserve. Continuity of ownership will be absolutely essential to the survival of digital objects, because they require active and continual management by skilled staff over their entire life cycles - and how many active preservation regimes have

survived for millennia? Political instability will affect the preservation of digital objects in similar ways to that of physical ones, except that digital objects can be copied into several different places for safety.

Do physical environmental conditions affect the survival of digital objects? This is the only factor not wholly relevant, because digital objects do not primarily depend on the survival of physical materials, as we shall see below.

Will digital objects survive without action by people? There are examples of data surviving for over a hundred years, but this is not very long ... and if we discover them, will we be able to read them, or will they be like ancient languages which we still can't decipher?
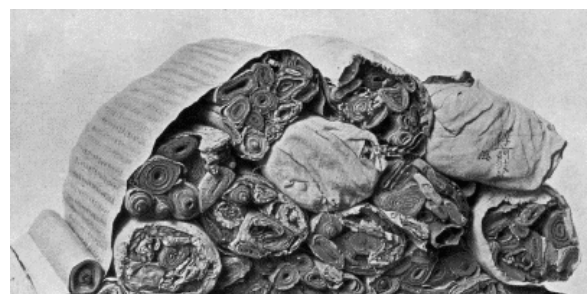

Fig.3 Bundles of Manuscripts from the cave near Dunhuang. (Photo: British Library)

5   Digital challenges

"Digital materials, regardless of whether they are created initially in digital form or converted to digital form, are threatened by technology obsolescence and physical deterioration." - Research Libraries Group report

The UK group UKOLN, which supports

cultural digitisation, has just produced a handbook which contains much useful practical guidance on digital preservation. The discussion below refers to this handbook.

Preservation policy: how long?

The Diamond Sutra has survived for over a thousand years, and all we had to do was leave it alone. It survived sealed in a cave, and I am sad to say that I think its life expectancy would actually have been better if it had stayed undiscovered. Are digital cultural objects like this? No; we have to make positive decisions at the time they are created as to how long we intend them to last.

The first issue to consider is the all-important policy for preserving these new assets. Different measures need to be taken depending on a decision for how long they are to last. Of course the decision must be recorded and the necessary actions carried out, not just for the first year or five years or so but for as long as we designate these items for preservation. The preservation category for the digital object needs to be decided at the time it is created:

Long-term preservation - continued access to digital materials, or at least to the information contained in them, indefinitely. This is going to be very expensive, and it needs to be decided right at the start.

Medium-term preservation - continued access for a defined period of time but not indefinitely

Short-term preservation - access only for the forseeable future, or until technology renders the asset inaccessible.

Physical storage

Storage media for digital assets are physically not very durable. Iron oxide particles deposited in carrying media onto synthetic resin tapes are definitely a recipe for trouble. Optical media such as CD ROMs consist of a number of layers of different materials, which is never a good sign for their future. So it will almost certainly be necessary to adopt:

Reformatting - Copying information content from one storage medium to a different storage medium (media reformatting) or converting from one file format to a different file format (file re-formatting).

Tracking and finding the object

Searching for an image in a large collection of digital files could be like searching for a grain of sand in a sand dune.

Fig.4   The singing sands on the edge of Mingshashan. (Photo: Oliver Wild)

How do we keep track of these digital assets? Tangible objects generally carry the means of identifying themselves: they can be decoded by art historians. And we know the objects are there because we can see them. Collections of digital images are just a long list of numbers. Digital assets have to be catalogued at the time they are created, because otherwise we don't even know that they exist.

Metadata is catalogue information about digital assets, and without it we can't find what we want, and we won't know it is there, nor what it is should we come across it by chance.

There are some interesting questions here, too. We have to guess now what features are important when we catalogue the object; but what will people in a few hundred years' time be interested in? A great deal of time has to be put into cataloguing the digital objects; it is not just a matter of creating a digital image. We have to catalogue the digital objects before we've even got round to doing this for the actual ones.

Ability to realise the digital object
It sounds complicated, but it's not: Will we be able to open the file?

These are the processes to do with being able to read and use digital assets in the future. As we all know, because of the spread of proprietary software formats and the profit-motivated drive to create technical obsolescence, we can hardly read text files that are more than ten years old. This is why it is very important for UNESO to support open source software such as Linux, and to insist on non-proprietary standards.

There are two main schools of thought on how to approach technical obsolescence. Some people say that it is easier to emulate the software that ran the original files so that it works on new machines:

Emulation: the imitation of obsolete systems on future generations of computers, so that the emulated software can make the digital asset accessible.

Other people say that it is better to convert the digital asset into a new file format that newer software can run:

Migration: the transfer of digital assets from one generation of technology to the next. Migration preserves the information content of the digital asset but does not necessarily result in an exact digital replica, nor in the original features of display and appearance.

Partial survival
Actual objects are very forgiving and resiliant. They can survive in fragmentary form, or with quite severe losses, and still be quite understandable. We have the choice of restoring them so that they look whole again, in ways that can be reversed if others subsequently think they would be better unrestored. Will it be possible to restore a damaged digital file? No doubt people in the security services are working very hard to solve this particular problem. But will they tell us how they do it?

Authenticity
Remember the robbers of the Time Tombs.

What's to stop someone creating or altering a digital cultural object and claiming that it is original and unique? What's to stop them creating a saleable 'new' digital collection, claiming that the real objects have been destroyed? As long ago as 1995 it was said in the Wall Street Journal that digital images constituted the largest art market in Europe.

Fig.5   The sunday market in Kashgar. (Photo: Oliver Wild)

This leads us to the final issue we need to consider. If files are being converted or copied, how closely do they need to resemble the original file that was created? Is this important at all? so we also need to consider:

Authenticity: that digital material is what it purports to be. The trustworthiness of an electronic record, or the fact that a 'born digital' asset is the same as it was when it was first created. Authentication is the process that would attempt to establish the degree of authenticity. There are ways of doing this, through measures like embodying a digital watermark in the image.

I also have to introduce a thought about **obsolescence**. Technology advances. How many digital images made ten years ago would be considered of high enough quality for serious use today? What if an imaged object is conserved, and becomes more readable? In the International Dunhuang Project, the documents from the British Library's collection are being conserved or in some cases re-conserved before they are imaged, for this very reason.

6   Return to the Time Tombs

Let us revisit the story of the Time Tombs. Even though the situation is entirely imaginary, it has some relevance. The digital objects in the tombs could be made to exist after thousands of years. They had survived technological obsolescence because the recording medium was preserved along with the technical means to make it exist. The authenticity of the images was assured, and there was no problem about finding and identifying the object because each one was unique. The media and the technology had physically survived because they were in a physically stable environment and, we must suppose, because the tapes and the machinery were made of very durable, long-lived materials.

7   Conclusion

Preserving digital cultural objects is not going to be easy. If the digital object is an image of an actual object, then the actual object is always going to be the basis for the digital assets' existence. Fortunately, it is often less difficult to preserve the actual

objects than it is to preserve the digital ones, and I am sure that all countries will continue to be committed to preserving their real, tangible heritage.

But digital objects have a very valuable place as well. They can augment the actual ones in many wonderful ways, so we have to preserve them too. They can help us to capture and preserve the intangible heritage. When people have got tired of traditional languages, songs, dances and theatre and want to take up new forms, we can preserve the traditional performances too in digital form, and recreate them centuries hence. More and more, artists and authors are using digital media to create unique digital objects, objects that are 'born digital'. Digital objects are acquiring a cultural dimension of their own.

This paper has set out some of the issues we have to consider in preserving digital objects. With cooperation and effort, we can hope to keep wonderful things like the new interactive star maps that Kim Veltman describes, alongside the thousand year old Star Chart, the oldest manuscript star chart in the world.

Fig.6　Star Chart, c. AD 940, in the Dunhuang collection in the British Library. (Photo: British Library)

Acknowledgements

Organisations

The British Library:
The International Dunhuang Project
URL: http://idp.bl.uk/

The Digital Preservation Coalition
The British Library, PRO, universities,
government
http://www.rlg.org/events/pres-2000/
beagrie.html

UKOLN: the Office for Library and Information Networking
http://www.ukoln.ac.uk/

Washington: Commission   on Preservation and Access

The DLM Forum
European citizens and electronic information: the memory of the Information Society
http://europa.eu.int/ISPO/dlm/

PANDORA
Preserving and Accessing Networked Documentary Resources of Australia
http://pandora.nla.gov.au/

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