Cultural Heritage Information: Artefacts and Digitization Technologies

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Since the 1970s, the gallery, library, archive, and museum sector has promoted and encouraged digitization -   to increase access to cultural heritage material through various incarnations of digital media. Indeed, it is now expected by both users and professionals that institutions should be undertaking digitization programs, and best practices in this area are now well documented and understood. This chapter scopes out the background to the current digitization environment, giving an overview of the methods and approaches involved. It points to current developments, highlighting the use of both two and three dimensional capture methods for the creation of digital surrogates of objects and artefacts, indicating the potential for further development in the sector, whilst drawing attention to current issues faced when digitizing objects and artefacts including cost, sustainability, impact evaluation, and expectation management in the changing information environment. The affordances of previously prohibitively expensive techniques – such as multi-spectral imaging and 3D scanning – are now available at relatively inexpensive rates, which also raises questions about digital literacy and our understanding of what it means, for both the end user and information professional, to create digital versions of our cultural inheritance.

1. Digitization of cultural and heritage content

    "the conversion of an analog signal or code into a digital signal or code" (Lee 2002, 3),

The
information, culture, and heritage sectors were quick to embrace digitization technologies as they became available, primarily to facilitate access to items in collections by providing them in electronic format, firstly with the creation of electronic catalogues in the 1970s, then conversion of printed source material into digital files in the 1980s (van Horick 2005). One of the first digitization projects was the "Optical Digital Image Storage System (ODISS)" launched in 1984 by The National Archives and Records Administration (NARA) in Washington which aimed to test the utility of digital image and optical disk technologies for the reproduction, storage and retrieval of archival documents (see González 1992, 1998, and NARA 1991 for an overview).

As network infrastructure grew, and the cost of computational devices fell, users increasingly consumed digitized content (Naughton 2000), and libraries, archives, and museums continued to experiment with the appropriate application of digital technologies within their institutional remit, being

In the 1980s, digitization generally focused on specific

18th and 19th century journals (ILEJ 1999). At the start of the 1990s, then, "In the early days of the Web, museums provided some of the best content and some of the most compelling reasons to go on-line" (Peacock *et al* 2004). Towards the close of the millennium, "A decade of digitization and documentation for the Web … created a rich array of cultural and historical information across the museum, library and archive sectors" (ibid).

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[3] http://mechanicalcurator.tumblr.com/

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2. The Digitization process

Digitization is dependent on capturing a representation of existing, analogue material (as opposed to "born digital" media which was created on a computational system). It is important to establish that the act of digitization is one of translation: the resulting digitized representation of an original analogue object is not a replacement for the object. Computational systems depend on exact numerical strings. The ordinary, or "real" world, of our senses exists in a continuous flowing stream of signals across time and often space. A document – or even a traditional photograph of a document - exists in analogue, where a varying signal represents a continuous range of values. In order to record, copy, transmit, or analyse such a complex signal using computational methods, it is necessary to translate this into a form which is more simple, predictable, and processable. All telecommunication systems work with one underlying principle: the information to be sent is converted into signals which can be transmitted, and reassembled on reception, to be converted into something we can perceive as a fair copy of the original. Digital systems are those which rely on a sequence of discreet numeric values, rather than the unconstrained and continually varying qualities of analogue signals. Numeric values are used in digital systems for processing, display, transmission, and input: often sampling values from analogue sources in the process we call "digitization". Digital systems rely on the binary numeric system, where all numbers are represented using only two symbols, such as 0 and 1, known as binary digits or "bits". Strings of bits can build up a representation of text, image, sound, or 3D object, but the more complex the representation, the more bits are required to describe it, and the more complicated the mechanisms are that are required to capture, store, display, process, analyse, and convert the information held in the binary data stream.

Providing a digital representation of an analogue object has various advantages: the digital representation can usually be more easily copied, shared, accessed, analysed and processed than the original (providing users have access to computational infrastructure – such as machines, software, networks, and subscriptions, which should not always be taken from granted, see Gooding 2013). The creation of digitized versions of primary historical sources also opens up new potential for research using advanced computational methods, to show different facets, relationships, views, or details of the original content. However it should always be remembered, that although digital representations of historical artefacts can be seductive, they are not the historical artefact itself, as they are only a digital representation limited to what has been captured during the sampling process:

> A digital representation of an artefact is a representation of certain relevant characteristics of the artefact. It is not the original and complete artefact, nor even a metonymy or simulacrum of the complete artefact. It is only a representation of some "relevant characteristics" (Arnold 2008, p. 127).

2.1 Digitization Technologies

The introduction of digital camera backs as a means of digitization has superseded the previous methods which were flatbed and drum scanners. Both of these scanning methods are now obsolete and the standard for high-quality digitization nowadays is the use of professional digital camera backs in medium and large format made by companies such as Mamiya Leaf and Phase One. The accuracy and quality of the optical lens system used by these cameras is essential in minimising distortion. This method of capture … is also far quicker than the traditional scanning method as well as producing a higher quality image. This is due to the increase in size of the image sensor, commonly a CCD (charge-coupled device) chip in digital camera backs as well as the difference of the image sensor being static rather than having to pane across underneath the slide in a flatbed scanner… One of the advantages when using digital camera back duplication setups is the greater control over the light source, which is a lightbox consisting of a photographic flash with a uniform colour temperature… Since the launch of professional digital back cameras, there has been little development in scanning technology (Weidner 2013).

2.2 Digitization Guidelines

Producing digital versions of holdings through digitization has become an industry in itself, and there has been much effort devoted to producing guides to best practice for undertaking the digitization of library and archive material to provide a framework in which those who wish to undertake digitization of primary source materials can operate. The issue is that there are now over forty different guidelines for undertaking digitization in existence, and each of those

is a complex, multifaceted production. Each represents a synthesis of experience, drawn in part from earlier versions of a given guideline and in part from secondary literature, workshops and conference presentations (and other forms of hearsay), and the specific experience of consultants and other experts who develop a specific guideline (Conway 2009, p. 10).

Care should therefore be taken as to which guidelines are followed and used for advice, and part of project planning is to decide the protocols, benchmarks and procedures that a digitization project will use within a specific institutional context. Jisc Digital Media[7] (is a good first port of call for up to date digitization advice, but other commonly consulted and respected guidelines include

3. Digitization in Libraries, Archives, and Museums

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[7] http://www.jiscdigitalmedia.ac.uk/

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11 http://www.ucl.ac.uk/ls/europeanatravel/

ICT Policy Support Programme. The Enumerate project runs for three years from February 2011 and aims to "create a reliable baseline of statistical data about digitization, digital preservation and online access to cultural heritage in Europe" (ibid).

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http://ec.europa.eu/information_society/apps/projects/index.cfm?menu=secondary&prog_id=ECP
[13] http://www.europeana.eu/portal/
[14] http://www.enumerate.eu

The starting point should… be the mission of the organisation and the needs of the target audience. You need to know what you want to achieve and who it is for" (ibid, p.4.). Perhaps the biggest change in digitization in recent years is this necessary move towards understanding user needs and communities, rather than creating "scan and dump" or "build it and they will come" digitization projects (Warwick et al, 2008). Although, as we have seen in the Enumerate survey above, only one third of major cultural and heritage institutions across Europe have considered their digitization activities in enough detail to have such a policy.

This chapter has provided an overview of the current digitization environment in the cultural and heritage sectors. After a period of adoption and experimentation we are now at a juncture where institutions are expected to provide digital versions of their holdings, although there is much work to be done to create digital representations of all that is deemed to be digitization-worthy. Digitization has been shown to be a complex and costly process, in which the translation of analogue content into a digital form is only a small part: much is dependent on the institutional framework, resources, and aims in which the digitization project operates, rather than merely considering technical issues about capture and storage. Best practice in newer areas of digitization, such as 3D capture and printing, or the use of multi-spectral imaging, is still being investigated, and it will continue to be the case that as new technologies emerge their affordances should be explored for the particular use requirements of the cultural and heritage sectors. In addition to technical aspects, there are pressing issues regarding the use and usage of digitized resources, and how we can show that the digitization process adds value to the user experience, and to society at large. We are only just beginning to understand how institutions can best respond to a rapidly changing information environment, and evolving user expectations – which may not be combined with the same advances in digital literacy within our use communities.

Throughout this chapter, the importance of understanding institutional contexts and aims has been shown to be paramount when planning, or considering undertaking, a digitization project. Organizations must now take a more holistic view of the digital environment in which they operate, to understand their users, their resources, and the every growing potential inherent in the creation of digitized versions of historical and culturally important content. A wealth of digitized heritage material has now been created, with many more digital treasures to follow in the forthcoming decade. Attempting to understand the possibilities this delivers across the sector, to a wide range of users, is now part of the role of every individual digitization project, as we look to a future where further advancements in digital capture, access, search, analysis, and dissemination will affect how users interact with, perceive, and understand their cultural inheritance.

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end-35-mm-slide-transparencies/digitization.