CULTURAL HERITAGE REPOSITORIES:
Digital Archives for Conservation and Management

› cultural heritage
› management
› natural heritage

› protection
› repository
› world heritage

The unique and irreplaceable value of cultural heritage has long been recognized. Similarly, the need for accurate and detailed information about heritage for its conservation and management is well understood. Yet the records of our heritage have received less thorough treatment. From the need for heritage repositories, to the steps in creating them, this paper provides a high-level look at digital archives of cultural heritage. Using the evolving UNESCO World Heritage portal as our example, we provide an overview of the requirements for cultural heritage organizations, from planning to design, to deploy, and maintaining a digital repository, emphasizing information specific to the management, monitoring, and conservation of cultural heritage.

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<u>cultural heritage</u>

Cultural heritage – our shared legacy from the past – is a unique and irreplaceable source of identity and inspiration. As defined in the Convention concerning the Protection of the World Cultural and Natural Heritage (or World Heritage Convention as it is more commonly known), "cultural heritage" refers to "monuments", "groups of buildings", or "sites" with "historical, artistic, aesthetic, scientific, ethnological or anthropological… outstanding universal value"[1]. These heritage places can range from "a large area such as a whole region or landscape" to "a small area such as a feature or building"[2].

With recognition of the universal value of these heritage places has come increased focus on their conservation. From the creation of the world's first national park at Yellowstone in 1872, to the adoption of the World Heritage Convention by the United Nations Educational, Scientific and Cultural Organization (UNESCO) on the 16th of November 1972[3], we have increasingly sought to identify, protect and preserve our heritage. Today heritage conservation is a major discipline, with thousands of professionals, from archaeologists, to architects, historians, museologists, masons, surveyors, and others working to conserve and manage cultural sites across the globe.

Fig. 1: Aachen Cathedral, a UNESCO World Heritage Site in Germany (photograph by M. Santana).

HERITAGE INFORMATION

The growth of the field of conservation has brought with it vast quantities of heritage information, from scientific records, to historical studies, surveys, inventories, photographs, maps, and field documentation. Once laboriously collected by hand and recorded on paper, this information is today increasingly gathered, organized, and archived digitally. Today it plays a vital role in defining a heritage place's significance, integrity, extent, and threats, and is crucial to understanding, protection, and management.

Information challenges

Yet the explosion in heritage information has exacerbated 3 key data challenges:
1. Fragmentation: despite the importance of this information, it remains largely disjointed, typically residing with the individuals that produce it rather than in shared or common repositories known to a site manager or international conservation organizations.
Sadly, this means that valuable time, resources, and knowledge are often lost in reproducing already completed work, adversely impacting on heritage places and their conservation.
2. Reliability: with increased awareness of heritage, has come increased information and documentation of cultural heritage.
The ubiquity of digital cameras alone has led to the production of more imagery of cultural heritage in the last decade than in all previous recorded history.
Although often well intentioned, the rapid growth in the quantity of data, as well as numbers and backgrounds of individuals producing information about sites,

has brought with it significant challenges. Mislabelling and miscategorization is common. Without provenance, professionals find it hard to trust much of this new generation of information.

As shown in Tab. 1, reliability, especially with the new era of digital data, has five sources of error or bias.

Error/Bias	Description
Artifact	Sites are not constant – they evolve, age and are modified over time, meaning data about them must consider what point in history it is pertaining to.
Device	From rounding errors to calibration and issues like CCD color accuracy, the tools play an important role in accuracy.
Environmental	From temperature to sunlight and cloud cover, environmental conditions play a role in accuracy.
Human	Perhaps the hardest to identify, human error/bias is always present to some extent.
Provenance	Without an attached record of why, how or with what, where, and by whom, accuracy is limited.

Tab. 1: Information Reliability (from Addison 2006).

3. Longevity: although information survival has always been an issue, the growth of digital records has also increased a long-standing problem. As illustrated in Fig. 2, without special care, heritage records today stand little chance of surviving as long as the monuments they are meant to document.

Fig. 2: Record Longevity (from Addison 2006).

Heritage repositories

institutional repositories

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Necessitated by both the quantity of information, as well as the burdens of archiving, organizing, and disseminating it, researchers and heritage managers have deployed a broad array of tools and methods to store their records.

These new repositories are largely ad-hoc, developed in-house to solve specific challenges.An overview of the types of information systems in typical use today are presented in Tab. 3.

Often important for making informed decisions about the identification, classification, management and conservation of heritage places, some of these systems are also valuable aids in promoting cultural identity and tourism.

Types	Pro's	Con's	Examples
Physical (document and photographic inventories and catalogues)	+ Simple to setup + Low cost	- Typically linear/hard to cross-index - Hard to search/query - Physical storage requirements can become a challenge	www.nps.gov/history/hdp/standards/CRGIS/paper.htm (description of a planned migration from paper to digital)
Localized electronic databases	+ Highly customizable + Relatively easy to get started with + Simplifies indexing	- Interaction with other inventories is difficult - Non-standard, specialized query tools hard for novice users - Adding and managing data can be complex	www.kikirpa.be/www2/en/doc/docu.htm www.mip.berkeley.edu/spiro
Geographic Information Systems (GIS)	+ Strong data mgmt potential + Highly customizable	- Requires considerable input of mapping info. - Steep learning curve. - Can be costly	www.timemap.net http://zimas.lacity.org
3D Earth Viewers (online GIS with spatial imagery)	+Combines advantages of GIS with an intuitive and easy to understand 'real' background	- Not as useful for non-spatial data - Nothing more than a nice visual interface (i.e. little data management and requires other tools to extend)	http://earth.google.com http://worldwind.arc.nasa.gov www.microsoft.com/VirtualEarth
Hybrid, shared, 'Web 2.0' systems with relational data structures, XML, & other standards	+ Highly customizable, adaptable, and shared	- Emerging technology	http://whc.unesco.org

Tab. 3: Types of heritage information systems (based on research by M. Santana).

BUILDING A DIGITAL REPOSITORY: LESSONS FROM UNESCO'S WORLD HERITAGE PORTAL

Using the UNESCO World Heritage web portal (http://whc.unesco.org) and its redesign as our example, the steps in creating a modern repository are outlined below.

The official web site of UNESCO's flagship Convention concerning the Protection of the World Cultural and Natural Heritage, the World Heritage portal is the source of the most definitive information about the World Heritage List, the Convention, and its many partners around the world.

Both the repository of all statutory information about the treaty, as well as a public information tool, scientific material archive, community workspace, and news source, it illustrates many of the challenges of a modern heritage repository. It serves as an information dissemination and exchange tool at an international, regional, and local level, raising awareness and aiding in conservation management, monitoring, and mobilization.

Fig. 2: UNESCO World Heritage portal (accessed: 23/06/2008).

There is a wealth of information about heritage documentation, from what is useful to collect, to how to collect it, and standards for organizing it. The following documents, although not specifically about digital repositories, provide a good background on heritage information and are an important starting point for anyone who wants to develop a digital cultural heritage information repository:

› Principles for the analysis, conservation and structural restoration of architectural heritage (Charter ratified by ICOMOS in 2003)[4];

› ICOMOS Principles for the Recording of Monuments, Groups of Buildings and Sites (Principles ratified by ICOMOS in 1996)[5];

› Guidance on inventory and documentation of the cultural heritage (available as a book from the Council of Europe, 2002)[6];

› The Core Data Index to Historic Buildings and Monuments of the Architectural Heritage (1995 Recommendation of the Committee of Ministers of the Council of Europe, adopted in 1998 by the Getty Information Institute's ObjectID program and available in the book Documenting the Cultural Heritage, R. Thornes and J. Bold, eds.)[7];

› The International Core Standard for Archaeological Sites and Monuments (1992 Standard from the International Council of Museums (ICOM) International Committee for Documentation (CIDOC) in collaboration with the Council of Europe, adopted in 1998 by the Getty Information Institute's ObjectID program and available in the book Documenting the Cultural Heritage, R. Thornes and J. Bold, eds.)[8].

Defining goals and organizing data

A well-designed cultural heritage repository should:

› Safely store multidisciplinary knowledge of a place, its value/significance, and integrity;

› Archive together all a place's rich media, from maps to images, drawings, documents, CAD files, movies, audio recordings, etc.;

› Allow intuitive querying and straightforward contributions of additional records;

› Guarantee long-term viability of the records through clear, simple, and human-decodable data structures;

› Promote interest and involvement in the preservation of the heritage through the dissemination of acquired information;

› Enable informed decision making;

› Ensure that a place's management, maintenance and conservation is related to its integrity (physical form, materials, construction, etc) and its historical and cultural significance.

To fulfill UNESCO's and the Convention's mission, the World Heritage portal needed to accomplish a series of goals that included improving accessibility and enhancing and linking information about the Convention, and its sites, stakeholders, and activities. This could only be accomplished by organizing data in an effective and coherent repository with easy public access via an interactive web interface.

In the case of the World Heritage portal, it was decided early on to group the underlying data into 7 key categories:

1. Sites (the List of protected sites);

2. States (the Nations that have signed the Convention);
3. News (news about the places);
4. Activities (projects about the places);
5. People (from staff to the conservation workers, site managers, researchers, and the public with interests or activities at places);
6. Money (financial assistance expended in support of sites);
7. Documents (from official reports to images, maps, movies, and other rich media).

Each of these categories is 2-way referenced to every other to allow rich and fast searching and interrelationships. In addition, data is increasingly thematically and spatially tagged wherever possible. Although certain data is available only to the World Heritage professional community upon site login, a vast amount is publicly accessible. Among the most visited pages are those of the individual World Heritage properties.

These 878 dynamic pages present a friendly interface to a vast repository of information previously only available in paper archives. Since the design of the data structure cross-links seven key categories of information, a wealth of related data can be pulled and displayed for each site, from imagery to official decisions, nomination files, and so forth. The information available from the site pages includes (although not all is publicly accessible):

Main Tab
› Name, Location and Latitude/Longitude position
› Flag and Country (cross-linked to country information)
› Zoomable flash map showing location in the world
› Iconic image of site
› Date of inscription and Criteria (summary)
› Official "Brief Description"
› Justification for inscription and Statement of Significance/OUV
› Related News, Events, Activities, and Web Links

Locations Tab
› Coordinates and descriptions for serial sub properties
› Scanned nomination maps (under development)
› IS tool (under development)

Media Tab
› Photographs, panoramic images, CAD files, movies, sound clips, etc

Documents Tab (a sortable list of all official records mentioning the site)
› Nomination file as originally submitted to UNESCO
› Decisions of the World Heritage Committee about the preservation of the site
› Annual State of Conservation reports
› Longer-term Periodic Reports on conservation status as submitted by States
› Mission reports of site visits

Issues (Threats) Tab
› Danger listing
› Details of danger listing
› Threats statistical graph
› Photographs of issues (under development)
› Related Information (under development)

A 'related information' section, currently under development, will allow the user to contribute research papers, news, events, multimedia files (photographs, QTVR panoramas, sound, CAD, and other relevant files), links, etc. This will allow WH staff, site managers, professionals, and the public to interact towards a better understanding of the site and its needs. This should enrich preservation activities and the decision making processes as interested parties use the portal to exchange preservation information (otherwise transferred through meetings and personal contacts), to carry out benchmarking analyses, and to define shared policies.

These interactions will be managed offsite by the 'Virtual Heritage Network', an associated organization to the World Heritage Centre's Information Management Initiative. This organization's remote servers will allow Web 2.0-like community input contributions, which could not be hosted by UNESCO itself, as they are not official governmental records.

Fig. 3: A World Heritage Property sub-page details, UNESCO World Heritage Centre[9].

Choosing a technology platform

In the digital world, technology choices can have far-reaching consequences. Given the rapid advances in digital technology, choosing a system is particularly challenging. In the case of the World Heritage portal, moving from paper records and a simple html website to an advanced digital repository presented many challenges.

A variety of complete 'commercial off-the-shelf' tools were proposed but all ultimately rejected as they hid the data in a 'black-box'. Knowing that technology would evolve and such a system would eventually need to be replaced, we considered it crucial that the underlying data structure be designed, clear, intuitive, and visible. Instead of selecting a single system, the World Heritage portal uses an assemblage of tools. At its heart is an open-source relational database (MySQL). On top of this, the website is driven by a commercial web development language (Adobe's ColdFusion), which at the time the project started was considered more stable than some of the other open-source tools (such as PHP) then beginning to emerge. Much of the look and feel is controlled with style sheets (CSS), Flash, Javascript, etc. This is an evolving project and in the future the scripting language will likely be migrated into either a 'code framework', to make code management easier, or potentially even into one of the many community-supported 'content management systems' (CMSes) built on PHP, ColdFusion, etc.

Providing a simple, intuitive interface

As important as the underlying technology is ease of use. Many repositories today (including online heritage photo archives) can be challenging to use, from

complex interfaces to specialized data classification and search systems. Good data organization is a first step, but a clear and simple interface is also crucial.

Before the launch of its new online repository, UNESCO's World Heritage Centre relied upon an overcrowded static website, printed newsletters, journals, and books to disseminate knowledge and issues related to its mandate as Secretariat of the Convention. This led to a considerable gap between the information available at the World Heritage Centre and the amount of information being disseminated to stakeholders and the public in general.

Today the World Heritage Centre has a dynamic engine and regularly updated content, which serves thousands of professionals and public users every day. Each of the 878 current sites on the World Heritage List can be accessed geographically using a dynamic world map, by region, by category or by simple typing its name in the internal search engine.

Each property has its own dynamically generated page, providing the most up-to-date information, from facts, to documents, activities, partners, financial support, events and news. Similarly, there are dynamic and richly cross-linked pages for each of the States Parties to the Convention, as well as news, projects, events, etc.

CONCLUSIONS

browsing

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Using the UNESCO World Heritage portal as an example, this paper has presented a set of ideas useful for the creation of effective digital repositories for heritage. Although still in its early stages, the new World Heritage web portal has already shown itself to be a useful conservation, communication, and archiving tool. With more than 600,000 visitors each month, and one-third of all UNESCO web traffic, it has quickly grown to be one of the most powerful tools in World Heritage conservation and communication.

Although successful, much still remains to be done. The final step of building any repository is to launch, track and refine it. Future goals for the World Heritage portal include Web2.0-like features to allow authorized users, from site managers to governments, to directly update and contribute new information, news and multimedia in a tracked, Wiki-like format.

User interface improvements are also planned, from general layout, to better media gallery tools and customization based on general user type (from general public, to child, researcher, and site manager). Using the power of the web and the growing numbers of related professional and amateur repositories, from Flickr photo libraries to serious archives like ArchNet, future plans call for using next generation web technologies to better interlink and cross-reference repositories while ensuring archival viability.

NOTES

[1] http://whc.unesco.org/en/conventiontext/ (accessed 15/07/2008)

[2] Australian Heritage Commission. Protecting local heritage places: a guide for communities, Sydney 2000, p4

[3] http://whc.unesco.org/en/conventiontext/ (accessed 15/07/2008)

[4] http://www.international.icomos.org/charters/structures_e.htm (accessed 15/07/2008)

[5] http://www.international.icomos.org/recording.htm (accessed 15/07/2008)

[6] http://book.coe.int/EN/ficheouvrage.php?PAGEID=36&lang=EN&produit_aliasid=1369 (accessed 1/07/2008)

[7] http://www.object-id.com/heritage/index.html (accessed 15/07/2008)

[8] ibid (accessed 15/07/2008)

[9] http://whc.unesco.org/en/list/211 (Last accessed: 2/6/2008)

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