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Cultural Heritage and the Information Technologies: Facing the Grand Challenges and Structural Transformations of the 21st Century

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CULTURAL HERITAGE AND THE INFORMATION TECHNOLOGIES

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Facing the Grand Challenges and Structural Transformations of the 21st Century

The Epoch Network of Excellence in Processing Open Cultural Heritage has set for itself a grand challenge, in its primary objective of providing “a clear organisational and disciplinary framework for increasing the effectiveness of work at the interface between technology and the cultural heritage of human experience represented in monuments, sites and museums.” (EPOCH 2007) More specifically, this framework is intended to “encompass all the various work processes and flows of information from archaeological discovery to education and dissemination” seeking to identify obstacles to smooth integration and flow of information and thereby to establish overall research priorities.

The natural focus of EPOCH’s evolving Joint Programme of Activities is thus the design of a wide range of practical applications and actions to address the existing challenges to effective and efficient integration of cultural heritage and information technology. Yet these are not engineering challenges alone. In accordance with the larger social and economic objectives of IST in FP6, EPOCH must also help to “increase innovation and competitiveness in European businesses and industry” connected with the heritage sector and to “contribute to greater benefits for all European citizens.” (CORDIS 2007)

Indeed, over the last few decades, the potential of CH ICT for providing such

economic and social benefits has already been demonstrated, particularly in the fields of data collection and analysis; in management and monitoring of cultural heritage resources; and in public presentation activities at museums and sites. The development of a wide variety of networked digital field recording techniques and databases has added efficiency, cost-effectiveness, and power to the task of accurately documenting and analyzing monitoring the physical state of sites and standing historical monuments. Management and spatial planning of heritage resources by local authorities and heritage administrations have been made more effective and flexible through the use of Geographical Information Systems, database design, and new networking technologies.

Digital visualisations have now begun to rival linear narrative as a main method of historical documentation and interpretation for both scholarly and educational audiences. Public presentation and educational programmes have now come to include immersive environments, multimodal interfaces and haptic applications for the study of sites and objects. The use of virtual human figures as avatars and dynamic elements in virtual historical environments have offered unprecedented opportunities to link the visitor experience with vast amounts of well-researched information about past societies.

These developments in data processing, visualisation, and methods of public presentation are important foci for EPOCH’s research agenda, but the longer-term relevance of that agenda—and above all, the long-term

usefulness of its research results—must also take into account the current transformations and emerging structural trends in the field of Cultural Heritage itself. For the interface of culture and technology on which EPOCH focuses its efforts is not a static boundary but a hazy border area, where institutions in *both* the ICT and CH sectors face challenges from shifting economic conditions and changing government policies. Integration must be an ongoing process, not a one-time accomplishment.

This paper will therefore concentrate on the following four main areas of special concern in the CH sector that will likely exert a significant structural impact on working practices (and the potential for ICT integration) over the coming 10-15 years:

- ***Intensifying Physical Threats*** to heritage of all types from natural deterioration, urban and industrial development, deliberate destruction, and climate change, all on an unprecedented scale.
- ***Competing CH Research Paradigms***, making the sharing of information across and within the present disciplinary boundaries increasingly difficult.
- ***Marketisation of Culture***, forcing cultural heritage organizations and institutions to become increasingly dependent for their very survival on independent sources and methods of income generation.
- ***Questions of Heritage and Identity in an age of increasing ethnic and cultural diversity***, posing challenges to traditional definitions of “national patrimony” and transforming the role of heritage in contemporary society.

EPOCH’s success or failure in recognizing and facing these challenges may well determine the future of its ICT integration efforts and may arguably influence the evolution of heritage itself in the coming decades.

Conservation Challenges: Material Heritage in Danger

The physical conservation of material heritage resources is perhaps the central task of the CH sector. It represents the material basis on which all scholarly and public understandings of heritage lie. Ever since the adoption of the Venice Charter (ICOMOS 2001), the overriding concern for the conservation of authentic physical fabric has been the foundation of all accepted international heritage standards and policies. And in the past two decades enormous strides have been made within the CH sector by such international institutions as the Getty Conservation Institute, the Institute for Conservation, and ICCROM to address specific problems in the physical conservation of various types of ancient materials, monuments, and artifacts. (GCI 2007, ICON 2007, ICCROM 2007)

In this challenge as in the others that will be mentioned in the following pages, some important achievements have already been made through the use of information technology. Indeed, the initial surveys of EPOCH’s Sector Watch have highlighted CH stakeholders’ concern with more effective ICT tools for 1.) detailed, and in some cases, three-dimensional documentation of the physical state of objects and structures, 2.) accurate monitoring of progressive change or deterioration, 3.) visualisation and modelling of original, anticipated, or desired future states. The EPOCH Research Agenda has, in turn, underlined the importance of this realm of activity and has identified a wide range of applications with direct relevance for physical conservation activities (Arnold and Geser 2007: 32).

Yet even the briefest glance at the World Monument Fund’s “Watch List” (WMF 2007) or the ICOMOS “Heritage @ Risk” reports (ICOMOS 2005) indicates the enormous scale of conservation threats to all types of material heritage. In growing, already congested urban areas, the physical deterioration of standing historic structures and archaeological sites is due not only

to the natural processes of exposure and physical deterioration, but is exacerbated in many cases by their vulnerability to pollution, vibration, and vandalism. Social and economic developments, rather than purely chemical and mechanical processes are now primary factors in the increasing scale of conservation work. Rapid industrial development in formerly rural areas and regions endangers sites and monuments whose remoteness from population centers once protected them.

Widespread looting of tombs and sites in developing areas feeds the thriving antiquities market in the more developed ones. In regions where cultures and religions are in conflict, the conscious destruction of archaeological sites has become a part of contemporary inter-communal warfare. Most ominous of all, global warming is also taking its toll with the rise of sea and ground water levels in some places and increasing aridification in others. Unique frozen deposits (for example, the frozen mummies of the Mongolian steppe (Gheyle 2006) and the delicate heritage of polar areas (Chaplin and Barr 2007) are thawing, with the consequent destruction of their uniquely preserved remains.

The scale of each of these threats is unprecedented and growing. Taken together, they represent a level of antiquities destruction that is itself of historic proportions, from which no region of the world is immune. Both in the cases of protected antiquities in developed countries and uninvestigated remains in developing regions, this limited and non-renewable resource is rapidly shrinking, offering a grim prospect of a future with a badly depleted communal resource of cultural heritage and the vanishing possibility of documentation of the architectural and archaeological record. An increasing number of international appeals and statements of scholarly concern have been distributed to highlight particular cases of dramatic conservation emergencies. Likewise, some innovative fund-raising methods have been attempted in the US through the use of private philanthropy and in the UK, through the Heritage Lottery Fund. Televised con-

tests to select heritage sites for thorough conservation and publicity campaigns to “save” endangered universal heritage (as in the notable cases of Machu Picchu in Peru, the Mostar Bridge in Sarajevo, the Buddhas of Bamiyan in Afghanistan, and the looted sites and museums of Iraq). But beyond such high-visibility projects, chosen on a case-by-case basis, the wider problem of global heritage ecology has yet to be addressed in an adequately systematic or uniform way.

It is increasingly obvious that a new, regional and worldwide approach to heritage conservation is needed that can grasp the true dimensions of the problem we now face (Lozny 2006). At a time when the budgets of antiquities and monuments services are already stretched to the limit, and with an ever-widening definition of cultural heritage coming to include vernacular architecture, industrial installations, cultural landscapes, battlefield remains and the countless forms and expressions of popular and folk culture (textiles, photographs, posters, and personal memorabilia), the challenge of heritage conservation requires the adoption of an environmental sensibility—rather than a selective connoisseur approach. The more effective use of limited conservation funds will depend on a clearer empirical understanding of the scale and nature of conservation threats.

ICT can play a crucial role in analysing particular types of conservation problems, prioritising their importance, and providing networked data that can assist in the formulation of overall policies in the CH sector. In addition to monitoring specific processes of decay and deterioration, interlinked ICT networks can offer detailed and regularly updated “snapshots” and trend forecasts about the physical state of the entire range of material remains in a particular state, region or locality. As in the case of environmental planning, the goal cannot only be to preserve a particular kind of monument or object as an “endangered species” without taking into consideration the changes occurring in the wider “eco-system” to which it belongs. For heritage, in its physical aspects, must

be considered to be more than our society's attic of antiques. The material remains of the past are a part of our living present; in their omnipresence and visibility they offer individuals and communities alike a sense of who they are and where they are in the history of humanity (Lowenthal 1985). Heritage conservation should thus not be just a matter of spot restoration and consolidation of particular buildings and objects. As a kind of cultural "biosphere," conserved cultural heritage offers society a sense of time and historical orientation (Zerubavel 2004). Its loss or significant degradation will have far-reaching socio-cultural, as well as scientific, consequences.

Thus, in the coming years, CH conservators (working on specific problems at specific sites) and planners (focusing on regional issues of urban and infrastructure threats to material heritage) will need to work ever more closely together within the information networks that can be provided by ICT. More than merely developing tools for specific conservation projects, ICT must help create a new information structure for new multidisciplinary teams of heritage ecologists, simultaneously addressing the challenges of conservation on local and regional scales. Just as the environmental movement merged the formerly fragmented scholarly focus on biology, botany, geology, and zoology toward a more practical ecological collaboration, a new concept of the ecology of material heritage will require the same kind of institutional and conceptual shift. The failure to make such a structural transformation—leaving the process of conservation to arbitrary (if high-tech) "triage" operations at specific sites—will almost certainly fail to halt or even lessen the intensifying deterioration, degradation, and destruction of cultural heritage resources all over the world.

Intellectual Challenges: Fragmentation of Historical Scholarship

The assumption that "the cultural heritage of human experience represented in monuments, sites and museums" is a single, coherent undertaking is badly mistaken. Except for a common concern with the material remains of past societies, the differences of approach and intention are in many cases far more important than the commonalities. First of all the functional goals of various CH institutions differ. The approach of academic institutions is primarily *analytical*, seeking to stimulate and produce original research and formulate taxonomies, chronological sequences, and scholarly hypotheses about material remains. Although museums too may sponsor scholarly research and publish monographs and scholarly journals, their public function is primarily *communicative*: collecting, exhibiting, and conveying heritage significance to their visitors. And regarding monuments and sites services, their task is primarily *administrative*: documentation, conservation, and enforcement of laws that regulate the protection and conservation of moveable and immovable heritage resources.

This functional differentiation is further complicated by a wide variety of theoretical orientations within the entire range of historiographical and heritage disciplines (e.g. Trigger 2006, Wallerstein 2001, Johnson 1999). Alongside the traditional art-historical and culture-historical approaches to material culture (i.e. identifying and dating sequences of styles, artefacts, architecture, and larger arrangements of specific past cultures), are the anthropological approaches that seek cross-cultural typologies of the behaviour represented in the material remains. At the same time, processualists create dynamic models of ancient systems to test hypotheses about the mechanics of ancient societies. Structuralist and post-processual scholars, for their part, collect evidence to decode and deconstruct the unspoken "texts" that the material culture of every period is believed

to express. Each of these main intellectual streams represents a distinctive methodology of study, with particular preferences for certain kinds of data and distinctive and differing criteria for documenting and analyzing the evidence.

In addressing this issue of functional and intellectual fragmentation of CH data, ICT professionals—and in particular the EPOCH Network—have focused on the challenge of standardizing processes for data capture, networking, and interoperability as primary strategies for linking information throughout the entire CH sector (Arnold and Geser 2007). Through the development and use of CIDOC-CRM for encoding both newly captured and legacy data, the goal is to devise metadata standards “suitable to encode information about cultural artefacts and their history” (Arnold and Geser 2007: 74) and thus provide access to all researchers in an ever-growing repository of CH information in a digital form.

Yet the present fragmentation of data sources and collections is not merely a matter of inefficient or non-existent communication networks; it’s also a product of distinct and long-established disciplinary epistemologies. For example, the data systematically collected and used in art- or culture-historical research, is quite different from that collected and used by anthropologists, processualists, or post-processualists. Each CH research project can therefore be seen from an intellectual standpoint as the expression of a particular historiographical orientation, not merely the collection of objective material facts. And although there are many variants and combinations of the various CH research approaches, any attempt to provide a free information flow about the whole set of data about the past must directly and consciously contend with the fact that scholars dealing with material heritage in the range of specialized sub-fields see different types of data as significant. In a word, they are not all talking about the same thing.

Here too, the contribution of ICT can be something more than bridging a static interface between technology and culture.

The effort to establish interoperable digital tools for Data Collection, Structure, and Analysis can be the first step in creating innovative, new multidisciplinary forms of historiography. Widening access to new classes of networked data will encourage a deeper consideration of their commonalities and contrasts. No less important is the growing recognition of the importance of “Intangible Heritage.” By the terms of the UNESCO Convention on the Safeguarding of the Intangible Cultural Heritage, “Intangible Heritage” is defined as “the practices, representations, expressions, knowledge, skills — as well as the instruments, objects, artefacts and cultural spaces associated therewith — that communities, groups and, in some cases, individuals recognize as part of their cultural heritage.” (UNESCO 2005)

Although the accepted methods of collecting about Intangible Heritage are still in the process of discussion and crystallization (Munjeri 2004), their relevance to the wider objectives of ICT-CH integration are clear. The explicit mention of the relationship of intangible ideas and traditions to material objects, artifacts, and cultural spaces suggests that it is not a separate category of cultural heritage knowledge, but part of an evolving concept in which the ideational and physical are becoming more closely intertwined. Thus traditional notions of data collection, structure, and analysis and metadata standards must also take account of non-physical as well as physical evidence.

Effective ICT research tools have the potential of not only producing meaningful bodies of interlinked data that has been collected within existing disciplinary frameworks, but can also help to reshape the wider intellectual strategies for the study CH information and production of knowledge in the years to come. The goal is certainly not to create a single, dominating heritage discourse that is simply the sum of all its presently fragmented parts. Through the serious collaboration of ICT and CH professionals it can be the first step in creating innovative, multidisciplinary forms of historiography.

Socio-economic Challenges: The Marketisation of Culture

From the very inception of national European Heritage institutions in the 19th century, the stewardship and presentation of CH monuments and sites has been widely recognised as an official, public responsibility. But that responsibility is now undergoing a dramatic change. As with many other government functions throughout the European Union, the administration of CH resources is being gradually outsourced to private firms and private non-profit associations, in the belief that they can be more efficient and economical than centralized bureaucracies in the performance of certain well-defined tasks (Myerscough 2001). Thus in recent years, official CH heritage institutions have increasingly relied on outside contractors for management and personnel services, ICT training, salvage excavations and surveys, and conservation expertise—to the decidedly mixed reaction of CH professionals (for a basic discussion, see Canadian Heritage 2007).

Yet marketisation of culture has had another, even more sweeping effect on the practices of the CH sector: namely, the packaging, design and promotion of monuments, sites, and museums as income-generating “attractions,” structured and marketed with the same modes of tour booking, entrance fees, visitor services, restaurants, and gift shops, as other packaged visits of the modern mass tourist industry (Hewison 1987). In an era of steadily shrinking operating budgets, CH institutions such as sites and museums have in many cases had to rely for their independent existence and in some cases for their very survival, on visitor revenues, either generated directly or through franchise arrangements (Hall and McArthur 1998). With CH coming to be seen as a valuable and insufficiently developed asset in the context of Europe’s flourishing tourist industry, there is also a wider economic incentive for this trend. Governments at all levels have in recent years invested significant amounts to convert

modest archaeological and historical sites into “heritage attractions,” with the hope not only of supporting existing CH facilities, but also of stimulating the local economy with subsidiary services such as hotels, shops, and restaurants that can offer local employment opportunities. Public funding programs like those of the European Commission’s Interreg, EUROMED Heritage, Culture 2007 programmes, and the World Bank’s “Framework for Action in Cultural Heritage and Development” (Cernea 2001) have set standards — and offer substantial economic incentives — for public and private investment in ambitious heritage development projects.

ICT has played a key role in this process, providing powerful new digital tools for conveying heritage content to visitors and also in promoting more effective marketing of heritage sites (Owen et. al. 2004). The tools and approaches for public interpretation outlined in the EPOCH Research Agenda (Arnold and Geser 2007) include a wide range of visualization technologies, multi-modal interfaces, wireless PDA visitor guides, and augmented reality applications, designed to energise visitor interest and provide vivid heritage experiences. As such, the role of ICT in this new form of heritage presentation is prominent and visible, but it remains to be seen, from a strictly economic standpoint, whether it is a sustainable strategy for the integration of CH and ICT. The substantial costs of hardware purchase, installation, maintenance, and updating make it unlikely to be a dominant form of public interpretation — at least in the short- and medium-term in any but the most developed countries and in any but already well-visited sites. A general lack of detailed statistical data on investment-return rates and accurate estimations of hidden costs borne by the public in completed projects (such as roadbuilding and adjacent infrastructural improvements, traffic control, and waste disposal) makes useful generalisations about the specific economic contribution of CH to local economies impossible to rely on.

It is clear, however, that some sites, no matter how meticulously researched and

elaborately developed, will never attract large numbers of visitors, for the routes of tourism are exceptionally inflexible, based less on content than the convenience of nearby highways and airports, the pressures of itinerary planning, and the most comfortable facilities (Hamza 2004). Despite the attractive offers and funding, the likelihood of energizing local economies through heritage presentation must take into account the harsh calculus of investment costs vs. logically expected return (Briedenham and Wickens 2004). Although the academic tourism literature is filled with conceptual studies of new formulations like “co-opetition” among regional attractions (Buhalis 2003), the hard fact of the matter is that, in the absence of detailed market studies before initiating expensive heritage presentation projects, the decision of many local communities to embark on heritage presentation and valorisation projects may be risky from a strictly economic point of view (Rizzo and Throsby 2006).

New economic assessment methods are needed; the range of currently utilized valuation studies (detailed in Mason 2005) are the subject of discussion and development by both economists and CH professionals (Mourato and Mazzanti 2002). In addition the wisdom of the general movement toward the marketisation of CH properties and tasks has been questioned for its short-term economic orientation focussing on revenue-generation and cost effectiveness—and its relative neglect of such relatively longer-term CH priorities as sound conservation, preservation of site authenticity, and calculation of the hidden costs still borne by the government (Palumbo 2006).

As in the case of physical conservation, a long-term view needs to be taken and the role of ICT can be central. More than merely developing tools for specific presentation applications within marketed heritage attractions, ICT must help create new information structures for collecting, analyzing, and updating data about their performance for the effective shaping of future policies and development designs. Instead of taking the current economic trends for

granted, ICT can take the lead in monitoring the long-term economic dimensions of the cultural heritage field.

Cultural Challenges: The Function of Heritage in 21st-Century Society

Beyond its conservation values, specific research interests, and economic dimensions, CH in Europe has always had the important social function of fostering a sense of collective identity. Recent work in sociology has focused precisely on this value of CH for maintaining and enhancing a shared historical consciousness that encompasses all members of society and strengthens their sense of social cohesion (e.g. Zerubbavel 2004, Misztal 2003, Connerton 1989). The issue has also been addressed in relation to EU expansion and the promotion of an evolving concept of pan-European identity (Eder and Spohn 2005).

Yet when we refer to the identity-value of European material heritage, where should the boundaries be drawn? The nation-state has until recently been the main point of reference; antiquities services and preservation agencies have been largely focused on presenting a recognised and formalized “national patrimony.” Yet today, the multiplicity of ethnic and socio-economical identities and cultures in Europe offer a more complex and less homogeneous reality. The historical mainstream must be widened to take into account and include the diversity of European identities and cultures in the field of cultural heritage. Consequently, awareness has risen of the importance of protecting the rights of ethnic minorities, immigrant communities, and regional cultures to be represented as part of a diverse European heritage (Pendlebury et al. 2004, Hall 1999).

While social inclusion has often been seen primarily in terms of providing enhanced access to existing cultural heritage institutions and activities, it is crucial that the integration of ICT into CH not be restricted to “official” sites and institutions, but also create structures for individuals and groups within

society to express their own interest and pride in the traditions, monuments, landscapes and memories of particular significance to them. Some innovative experiments in the construction of web-based “memory communities” have been attempted and they represent a promising new arena for the creation of new forms of CH participation that acknowledges the importance of a bottom-up, rather than solely top-down approach to the presentation of heritage material (e.g. Giaccardi 2006). In this respect, one of the most pressing questions ICT integration faces is whether it will merely improve the efficiency of current heritage institutions, or it will help to build an evolving, more inclusive collective memory, combining the efforts both of official heritage administrations and the independent initiatives of a wide variety of individuals and community groups.

The integration of digital technologies into CH offers a unique opportunity for increasing the flexibility of interpretation activities – in their capacity both to collect and to structure large quantities of divergent data for selective retrieval both within and outside the formalized heritage institutions of museums and sites. They offer an independent channel – not only of one-way heritage communication – but also a forum for wide public discussion, reflection, and creativity. Within the CH sector, the communication of CH information is no longer seen solely as a process of distilling scientific results and presenting them to a largely passive public but encouraging their active participation in the documentation and discussion of the sites, objects, landscapes, and traditions in a variety of social contexts (Silberman 2006).

The EPOCH Research Agenda has already predicted that CH institutions, particularly local museums and site museums, “are going to move away from the static displays of artifacts and concentrate on establishing the structures for the creation of long-term, sustainable local memory institutions, in which the input of the public is central” (Arnold and Geser 2007: 49). Accordingly, ICT integration must also develop new applications for “user-generated content” and

create innovative web-based communication structures that will provide additional benefits to the general public in the preservation and inter-generational transmission of meaningful collective memories.

Conclusions and Prospect

The success and lasting impact of the EPOCH network lies on two foundations: technological excellence and attention to the greatest needs and challenges of contemporary heritage. Without attention to both, the impact of the technology to solve heritage’s most pressing problems will remain in question. For as repeatedly noted, the CH sector is in the midst of far-reaching conceptual and structural changes that must be taken into account. The challenge of ICT integration should not be restricted to the improvement of digital recording, data processing, and communication technologies, but of helping to shape the meaning and direction of the entire enterprise. In concrete terms, that means encouraging a transition toward a more inclusive, supportable, meaningful activity of preserving and reflecting on the past that fits not only the information technologies but no less importantly, meshes well with the requirements and needs of the Information Age.

Constant assessment and reevaluation are essential and, to that end, the overall goal of ICT integration in CH should be the gradual dissolving of an interdisciplinary “interface.” With the passage of time and the close cooperation of the two sectors, new and sustainable organisational structures for CH can be created that will allow constant feedback between culture and technology, between past and present, and between the CH sector and wider society. Thus the task of the EPOCH network is indeed far more than an engineering challenge. Its goal should be to study the evolving technologies and techniques of heritage conservation, research, economics, and community participation and evaluate the potential of ICT to enrich scholarship and expertise in dealing with material culture and to heighten

public sensitivity to the universal values and particular modes of human expression embodied in our shared inheritance of cultural heritage objects, traditions, and sites.

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