



IST-2002- 507382

EPOCH

**Excellence in Processing Open
Cultural Heritage**

Network of Excellence

Information Society Technologies

D.4.13: Final State of the Union

A Proposed Curriculum for Digital Heritage Studies
Policies, Practices and Developments in Europe - Volume 3

Due date of deliverable: 28 April 2008

Actual submission date: 16 April 2008

Start date of project: 15 March 2004

Duration: 4 Years

Sorin Hermon (Editor)

PIN scrl

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

TABLE OF CONTENT

EXECUTIVE SUMMARY	3
A CURRICULUM IN DIGITAL APPROACHES TO CULTURAL HERITAGE INTRODUCTION	4
ICT AND EDUCATION FOR FUTURE CULTURAL HERITAGE PROFESSIONALS	8
DIGITAL CULTURAL HERITAGE - THE SPANISH REALITY	21
DIGITAL ARCHAEOLOGY CURRICULA: SOME ASPECTS OF THE STATE OF PRACTICE IN FRANCE AND TOURS UNIVERSITY EXPERIENCES	37
DIGITAL CULTURAL HERITAGE – THE GREEK REALITY	48
A CURRICULUM IN DIGITAL APPROACHES TO CULTURAL HERITAGE	65

EXECUTIVE SUMMARY

This report describes work in progress to define a curriculum that would answer modern needs of a knowledge-based society, where Information Society Technologies went well beyond of digital tools, but, as pointed out by last twenty and more years of research in social and behavioural studies, it continuously shapes the way we perceive our world, it enabled the access to an influx of information never precedent before and eventually accelerates the rhythm our society is evolving and forming. As such, EPOCH recognized the imperious need to understand whether the academic curriculum is adapted to cope with these rapid and evolving changes, and eventually propose a curriculum that would best reflect the multi-disciplinary essence of EPOCH, demonstrated in its research activity, as well in the academic curriculum. Consequently, following an extensive survey of existing modules, courses, academic programmes, vocational training and as such offers, summarized in previous EPOCH reports as well (see Niccolucci, 2006, Trainings Offerings and Needs in Europe), as well as continuous feedback received during the WP4 training activities and dissemination, a final event (see report on Events, 2008) was organised at BTA2007, Paestum, Italy. The event gathered together prominent scholars from the UK, Italy, Greece, France, Spain, Israel and Cyprus, which presented the situation in their countries related to the field of IST and CH as reflected in existing curricula. A round-table discussion, with the participation of the public, mainly academics from Italy, young researchers and students, followed, its scope being to receive a feedback as wide as possible, in order to, eventually, assemble these ideas and present them in a draft proposal for a curriculum in Digital Approaches to Cultural Heritage, brought to in this final report.

TOWARDS A CURRICULUM IN DIGITAL APPROACHES TO CULTURAL HERITAGE

INTRODUCTION

Sorin Hermon

Vast-Lab, PIN, University of Florence, Italy,

Email: sorin.hermon@pin.unifi.it

The use of new digital technologies for the research of Cultural Heritage (DCH) is a long discussed subject of the past decade and more, seeing the emergence of discussion groups, conferences related to the subject and a relatively vast amount of initiatives and researches related to it. However, despite an apparently vigorous start, there are yet relatively few academy programmes (and these are concentrated mostly in the Anglo-Saxon world, and mostly in the Northern American continent) fully devoted to this matter, treating it as an independent, complementary subject to humanities and social sciences. The scope of this report goes beyond trying to identify the reasons why after so many years of discussion, and after seeing in every day's life (but perhaps because of it??) the impact of computers in our society, there is still a reluctance and resistance from "humanities" to embark on the road of employing digital tools not only as mere knowledge representation and communication tools, but as powerful tools that enable researchers to create new knowledge, to explore new research areas and pose new research questions (and hopefully also answer them). Its final aim is to propose a curriculum for the study of Cultural Heritage using the emerging tools of the Information Society Technologies field. These should be viewed as real cognitive technologies that will not only facilitate the manipulation of the vast amount of accumulated data, but will offer new research venues and propose innovative research paradigms.

There are several, some obvious, some less, reasons why the academy should concern with DCH. Firstly and most trivial, we use computers in everyday life anyway – we send emails, write digital texts or browse the Web. At a higher level of complexity, we create databases and electronic publications, perform computer aided simulations and interactive text concordances. So why not teach these issues systematically, and without the danger of duplication of effort (teaching principles of databases both in the history department and the geography department for example).

But there is more to it. Although computers are basically human depended (garbage in garbage out) their powerful resources and computing capabilities allow us to investigate new research questions, explore new domains of knowledge and have a holistic approach and integrate research from different disciplines.

The famous old debate against the use of writing (argued that it will annihilate the humans' capabilities of memorizing and consequently of reasoning) can be used as a reactionary example against the implementation of new technologies. Moreover, since our evolution as a specie is exo-somatic (against the endo-somatic of the rest of the animals, who adapt to new conditions by changing various organs) – we develop organs outside the body that provide us the needed help on the evolutionary path (stone tools, fire, engines, telephone or computers). These external organs, related to generating and handling information, is crucial to the development of our cognitive abilities. Thus, cognitive technologies aid us to store and memorize large quantities of data by means of external organs (electronic publications, books, CD's, etc.), allow us to perform large scale, precise and powerful calculations or simulations. Moreover, by arguing that learning highly depends on knowledge structuring, the implication of the use of digital tools is self evident.

Another factor to be taken into consideration when evaluating the potential of IST into Humanities and Social Sciences is the basic nature of Science itself, being both an imaginative and exploratory activity **and** a critical and analytical activity. As such, digital tools which enable both high level computing or modelling and give space for innovative interpretation and evaluation through interaction with digital systems are the right medium to perform a scientific activity. Moreover, by using digital tools as learning tools, the learner is actually engaged in an activity of **doing science**, and merely just **memorizing science**, the real challenge being not having access to information, but stimulating the students to scientific inquiry. Therefore, digital resources are not enough by themselves to promote science; they should be approached as sources for scientific activities. As such, the value of digital tools and digital content is not in their complexity, innovative level or quantity, but the measure of their usability and their capability to serve as media for scientific work.

One of the first steps on defining a curriculum in digital humanities (DCH) would be the identification of the disciplines that enter in the category of humanities and social sciences and that would largely benefit from such a programme. Despite some differences in the internal organisation of faculties and departments, five main arguments have been identified as key research subjects: **society, ideas, text, material culture and environment**. These subjects are cross-departmental: for instance, one studying the social life in the remote provinces of the Roman empire in the 4th century AD would probably need to have strong knowledge in the archaeology of the place, should be able to critically analyze historical texts, but also literary sources, have basic notions in the history of art but also some level of sociology/anthropology knowledge. Thus, a student in the history department, who took a course in lets say text mark-up in his/hers department, will have a clear advantage over other students. Similarly, a student from the history of arts, who studied image processing and consequently is able to digitally analyse an image will have another kind of advantage, but in any case both will complete a partial research only, since each acquired a different (though complementary) knowledge on digital tools.

It was also quite clear that most researches in the humanities and social sciences are, by their nature, inter-disciplinary, and, as such, a curriculum in this field should reflect their elementary nature. A basic research pipeline, characteristic of humanities studies would have five major stages: **theory / methodology** – the intellectual framework of research, **data acquisition** – the process of collecting the raw materials of our research, **data management** – how we organise, store and archive the harvested data, **interpretation** – the core process of the research itself and finally **communication** – how we transmit our ideas and how we make public our research results. It is also clear that each step depends on a previous one (without research there is nothing to publish, but without data one cannot perform a research, while harvesting data largely depends on our research agenda, determined by a theoretical and methodological framework). Additional and complementary steps, necessary for sustaining research are *valorisation* of results, *evaluation* of their socio – economic impact and *legislative* issues regarding the research itself.

Thus, any CDH should reflect this process of transforming the gathered data into information and its further metamorphosis into knowledge. Such a program may be achieved by a truly inter – departmental cooperation, following the multi – disciplinary aspect of the field.

The articles presented below summarize the state-of-the-art in several European countries, which reflect in some ways different approaches to attempts at defining optimum programmes for various studies tangent to the field of IST and Cultural Heritage. As such, we chose to present here an overview situation of the field in four countries (U.K., Spain, France and Greece), each representing a different approach model for the definition of such a curriculum and different applied methodologies for its implementation. The last chapter of this report summarizes our proposal for such a curriculum, based on extensive survey of related programmes, mainly in the EU and USA, and following successful meetings and workshops focused on this theme.

ICT AND EDUCATION FOR FUTURE CULTURAL HERITAGE PROFESSIONALS

David Arnold

University of Brighton

Email: D.Arnold@bton.ac.uk

Abstract

This paper considers the likely educational requirements which will result from the increasing use of technologies within the Cultural Heritage sector. The levels of engagement with technologies for different participants and roles in the sector are considered along with the associated form that their education might take. To achieve this requires some hypothesis about the ways in which the professions may engage in the use of technologies and the degree to which technologies would be adopted and embedded in their practice. By considering the comparison with the changes in the nature of the architectural profession some tentative conclusions about the timescales, nature and requirements for the design of educational systems are reached.

Introduction

In common with virtually every sector of professional life, Cultural Heritage professionals are making increasing use of technologies in their everyday working lives. In fact, in many ways, the sector is a rather late adopter – a very understandable position given the sector's appropriate emphasis on conservation, and a technology sector that has exhibited continual change and short lived deployments of technological innovations coupled with fairly scant regard for long term preservation of data and systems.

It is also clear that there will be a range of technological capabilities required in the sector in the future. Again in common with the experiences in other sectors, the range of cultural heritage professionals can be expected to encompass a range of technological capacities. These capacities will be related to the degree of innovation that particular professionals seek to deploy in their working practices. At one end of the spectrum we can expect that some cultural heritage professionals will only become engaged with tried and tested technologies, where:

- safe, economic and effective deployment has already been demonstrated elsewhere;
- a range of supported tools have been deployed; and
- the main the issues remaining extant are the safe deployment of these tried and tested technologies in a new operating environment.

This last challenge will still remain a non-trivial exercise and the professionals involved will require a level of ICT literacy. In the future this will have been built up during initial training – development of the competences which all professionals in the sector can be expected to have as part of their core skillset on entering the profession.

The speed at which this initial training will adapt to include the required level of competences will be related to the perception of need. This in turn will depend upon the targeted rate of adoption of new technologies as standard tools by the profession. At what ever rate technologies are adopted, there will remain a backlog of Continuing Professional Education (CPD) need in respect of developing the competences of professionals already through initial training and working at some point in an expected 40 year career. In many cases such CPD is a mixture of gaining new insights and regularising informally acquired skills.

These basic-level skills will need to incorporate understanding of both data and process limitations including that:

- tools will have limitations in the range of situations in which they are useful
- the way in which they are used will impact the usefulness of the results
- the form of the results themselves have implications to the range of situations in which they are useful and
- any digital tools have implications in terms of working practices (operations and workflows) in terms of long term preservation, risk management and obsolescence.

The most difficult areas in which to predict training and educational requirements are where the advent of a new technology has a fundamental impact on the nature of the professional activities undertaken. The characteristics of these aspects are also addressed later.

Technology Adoption and the Nature of Change

Figure 1 illustrates the processes over time which characterise the adoption of new technologies in an application domain. This follows a life cycle where basic research results are used to underpin the development of practical tools (with some lag) and the tools are gradually adopted – starting with early adopters and progressing until the use is a standard part of the toolkit of every professional in the field. It is clear that at this point the education of every professional needs to include an understanding of the use of such tools and their limitations, but it is equally clear that this is not a “one-off” step change, but implies an evolution from such training as is required by early adopters to the systematic incorporation in the training of all professionals. This will be a gradual process and it is certain that the transition will be part of a wider raising of general awareness of ICTs and their use coupled with training in a variety of tools and techniques that are at different stages in the adoption life-cycle.

The Majority – Responsible Reflective Professionals

Education in the professions has increasingly recognised the need for “Continuing Professional Development” – the process by which professionals adapt their practice to the current state of research and development in their fields. Since tools are at different stages of maturity it must be true that the highest priority CPD will address tools that appear to be making a transition across the “chasm” identified in Figure 1, between early adopters and early majority use. Of course some tools will never be used by the majority, but may be standard use by a specialist minority. CPD in respect of such technologies would be a high priority part of the CPD requirements for accredited specialists in these fields but perhaps of less importance to others.

Similar distinctions would dictate the time at which it becomes necessary to consider the inclusion of education about specific tools and technologies in the basic education of all professionals at the start of their careers.

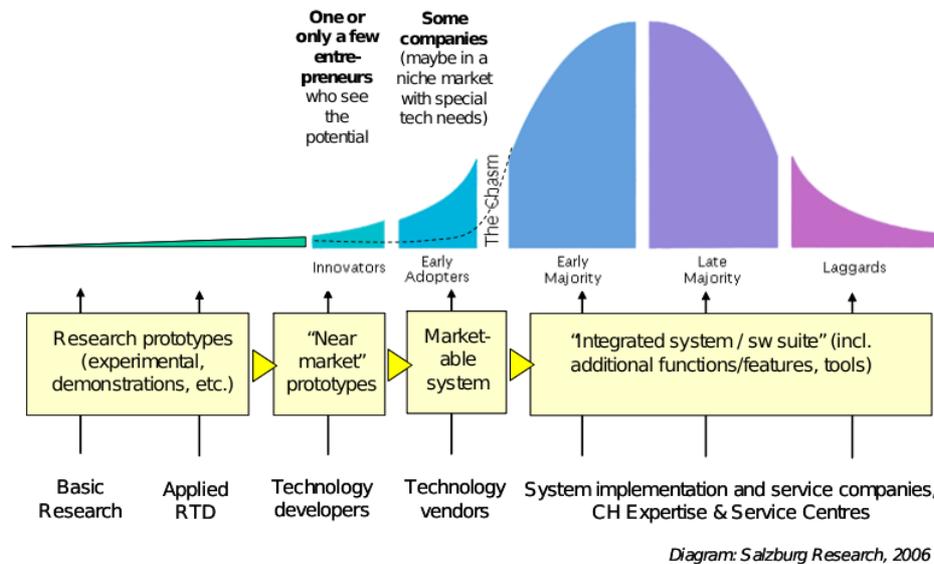


Figure 1: Adoption of Technology (From EPOCH Research Agenda -1st edition)

Of course this discussion on the timing of change in professional education ignores the difficulty of predicting when a technology has reached the transition point to mainstream use. In addition there will be an additional inertia in designing and deploying changes in educational programs, re-accreditation of programs etc. Given that re-accreditation tends to be on five year cycles in Higher Education these delays should not be underestimated – such change may take 5-10 years to permeate the sector.

There is also an issue in determining who is appropriate to decide that change has now become required and needs to be included in basic education for the sector. The obvious and appropriate place for such decisions is in the professional societies that accredit the competence of professionals in their fields. This will favour a conservatism, which is almost certainly appropriate given technologists’ tendency to introduce new tools as early as possible, which may be too early for the Heritage sectors. However it also places obligations on senior practitioners to be ahead of their fields by definition and, whilst this is a general obligation, the unrelenting pace of change in technological opportunity makes this sphere of scholarship especially challenging.

In practice developments appropriate to a generalist practitioner tend to have arisen within a specialist environment and then gradually broadened their field of application. The senior professionals who have ultimate responsibility for changes in the profession will be drawing advice and guidance from those in specialist fields that contribute to the overall picture.

The implication is that within the professions there will be a continuing need for early adoption and experimentation with potentially significant new technologies. To engage successfully in these activities some cultural heritage professionals will require technological understanding at significantly more depth than is the norm. We note in passing that there is also a complementary obligation on the technologists who would engage in development of new tools targeted at the Cultural Heritage sector to equip themselves more fully to understand that sector. There are thus at least three distinct levels of engagement that can be expected of professionals working in the field. These levels can be characterised as “sufficient” to:

- Participate in the profession (ie a requirement of all professionals in X)
- Engage with ICT professionals in the development of new tools
- Develop new tools for others to use

In each of these areas a matching CPD provision will also be required for those already in the professions.

Current supply situation

Whilst not based on a thorough survey even a quick review of the current situation in the UK implies some significant gaps, when it comes to addressing the likely impact of technology on professions related to Cultural Heritage. The levels described above do not appear to be addressed explicitly or systematically and the provision that has evolved seems to be distinctly lacking in many respects.

In the UK all Undergraduate admissions are undertaken through a central service – the Universities’ Central Admissions Service (UCAS). A search of the UCAS database of courses on offer revealed over 100 BA/BSc programmes which addressed different areas of cultural heritage (including, for example, archaeology, museology, librarianship and conservation) in their course titles. None of these made reference to technology within the program title. At one level this is not surprising and would be appropriate if all programs could be expected to have an appropriate level of ICT education within the program, but from the perspective of marketing it is significant in that UK universities are competitive and frequently suggest distinctive “flavours” or strengths through course titles. That none have done this suggests that it would not be considered a “market advantage” to provide anything beyond minimum expectation.

From these courses a representative selection of the online descriptions from each area were examined to review the level of ICT coverage included. While the survey was anything but systematic and thorough, the early indications were that the ICT components were low level and generic, with databases and websites as the dominant ICT areas named and syllabuses that implied fairly low levels of coverage. There were some mentions of GIS systems, but in this sample, no mention of digitisation, digital libraries, or knowledge management for example.

At the postgraduate level there is no equivalent of UCAS and hence to search for all programs that might be relevant would be labour intensive and beyond the scope of the current paper. However reviewing a sample of institutions with significant presence in the undergraduate level, the ICT coverage at Masters level appeared similar – no Masters programs were found that implied advanced ICT understanding for uses in the Cultural Heritage professions, although again the review was not conducted in great depth. Similarly an examination of specialist Masters programs on offer to students in Computing Science through a sample of Universities that seemed most active in fields relating to Cultural Heritage revealed no programs targeting ICT professionals wishing to engage in the Cultural Heritage sector.

The supply side of the educational provision therefore does appear to be limited, but is there enough evidence of the need for future professionals to have more on offer?

ICTs in Cultural Heritage

The EPOCH Network of Excellence in FP6 has been addressing the use of ICTs across the range of processing for data about physical cultural heritage in monuments, sites and museums. This holistic view has been described as a number of interconnecting processes, described as pipeline at times, but more appropriately perhaps as a set of processes which draw in information at particular stage of refinement and produce new information in a refined form. The results of any process maybe suitable as input to further processing as well as forming results in their own right.

EPOCH has considered the following processing types in this framework:

- Data Collection – primary and metadata
- Data organisation – collection formation
- Search and research
- Reconstruction and hypotheses
- Communication to the public
- Derivative works

Each area may draw on a different balance of underpinning technologies to develop appropriate applications. These include technologies for:

- GIS systems
- Mobile technologies for field work
- Data bases/digital resource management
- Search and research (location/ identification of resources and testing hypotheses)
- Communication (presentations, story-telling, multimedia)

There are other more generic office functions that would concern organisations working in Cultural Heritage (payroll, ticketing, sales etc) which have been largely omitted as beyond the remit of

technologies specific to the sector and this remains appropriate in considering the educational challenges for those in the sector. Part of the purpose of this analysis and this event is to begin a more systematic examination of what would be the educational requirements in respect of these potential uses for future professionals in the field. These requirements relate to normal, current professional activities and reflect currently available technologies. The education is required to support their inevitable uptake, and ensure that it is appropriate, as well as enabling future developments or be firmly based on requirement of the sector.

Designing Tools for the future

The advent of a critical mass of more ICT-aware Cultural Heritage professionals brings us to a final and very important benefit of enhancing the ICT education for this group – enhanced influence and participation in design and development of future tools.

ICT research has too often been open to accusation of being a “solution in search of a problem”. This not only gives the ICT research a bad name but inhibits more targeted and appropriate developments from achieving the take-up and deployment that they would merit, and wastes significant talent and resources in “blind alleys”. Whilst a certain amount of free enquiry and blue skies research is undoubtedly appropriate, this argument is all too often confused with lack of understanding of the sector purportedly being addressed.

In recent years the concept of “Use-inspired Basic Research” has attracted increasing interest and attention. The concept was elegantly expressed in Stokes book [Stokes, 1997] as covering situations where fundamental research is required to generate basic understanding of processes which limit progress in particular target application domains. Stokes describes Pasteur’s work on micro-biology as epitomising this approach since the basic research was always known to be targeting the food industry.

Stokes highlights the way in which “use-inspired” is often confused with “close to market”. In the context of this paper the importance of realising that these are different takes us back to figure 1. The research that prepares for future tools may well have a lead time of 10-20 years even if the benefits of success can be foreseen now. In the most fundamental cases these might be part of developing completely new ways of working.

To highlight the issues let us consider some developments that have taken place in architectural practice since research in the applications of technology to architectural design became commonplace.

Lessons from Architecture

Early experiments in the applications of computing to architectural practice addressed the challenge of assisting in then current manual processes, in particular draughting of architectural plans using what is now known as Computer Aided Design. Isolated aspects of the design process were tackled for example using increasing sophistication in structural analysis, thermal and acoustic modelling, and increasingly moving from 2D to 3D with enhanced visualisation of proposed built form, for both client and planners. Realism in these visualisations require increasing cognisance of the behaviour light and led to some significant advances in computing science – notably the advent of radiosity algorithms for computing light distribution in closed spaces. It was also probably concern to support architectural design which was most cited as the reason for developing sketch interfaces a field which continues to attract interest.

These individual aspects were gradually developed and integrating, requiring development of standards or agreements on data formats, which included shape and other data to feed other applications such as the production of cost estimates and bills of quantities. The development costs were normally justified in terms of being able to work more cheaply, but in practice being able to be more responsive to clients was probably a bigger advantage.

In parallel to these incremental advances there were a number of more radical lines of enquiry that might have fundamental impact on the design process itself. At one end of the spectrum these included further enhancement of the concept of pre-fabrication (which has much earlier roots). At the other end the advent of ICTs has enabled the design and construction of building that could not have been achieved without the technologies. The work of Frank Gehry might be seen as the epitome of this, although the technology is used later in the design process than might be thought. Buildings such as the Guggenheim in Bilbao or the Walt Disney Concert Hall in Los Angeles and others such as the Kunsthaus in Graz, Austria rely on ICTs to enable the vision to be built.

Designs such as these result from the adoption of practices that did not exist before the adoption of technology – a paradigm shift in terms of working practice. Similar transformations of working practice can be expected resulting from the use of ICTs by Cultural Heritage professionals. Two areas of prior conditions will influence the speed and direction that ICTs will have on ways of working within Cultural Heritage:

- the recognition of factors that can be seen to have nurtured change in others areas and
- the identification of working methods that might be valuable and practical if enabled by new ICT tools.

Going back to architecture profession, what has changed about the profession as ICTs have become standard tools within architectural practice? In terms of figure 1 the provision of basic draughting systems have become standard tools in use by at least the “late majority” in the developed world. In many cases practices have moved forward from such basic systems to, for example, more advanced visualisations, but even the move to basic CAD systems has only been achieved by:

- Massive investment in R&D
- Changes to educational practice
- Carrying through the necessary changes into education of a new generation of professionals
- Definition of new business processes (in some cases, processes that were not anticipated at the start of transition)

- Agreement on, and collection of, data required to support new business processes (e.g. databases of pre-designed prototype solutions – systems which had been in use since mass housing was first developed but where the availability of CAD versions allows more tailoring to individual client circumstances at reasonable cost)
- Still room for further innovation, but now in a context of better background levels of ICT literacy.

Potential Futures: Tools, Methods and Infrastructure

The EPOCH project has contributed to the development and demonstration of several new tools to the level of working prototype. Developments of fundamental significance can now be confidently predicted in all areas of processing listed above. In some cases tools have been made available to the community as initial versions (e.g. the EPOCH web-based 3D modelling service and Meshlib). These represent the basis of potential new working practices in the documentation of 3D artefacts and environments, but they have not had sufficient exposure to the rigours of general use to determine the type of training, the necessary conditions for practical use by CH professionals or the associated working practices needed to achieve their potential. These concerns have relatively little to do with the technical capability of the tools and much more to do with enabling the sector to use them by designing appropriate working methods and educating the target groups to understand the tools that are available to them and to use them effectively.

Other developments can be predicted with some certainty. There will be massive amounts of cultural heritage information available in digital forms, for example, but without a lot of orchestrated effort the potential for this data will only be partially realised. The most important factor is to ensure that new data is collected in forms that are interoperable and that tools are developed such that legacy data (previously collected data – analogue or digital) can be assimilated. However the full potential of this data will only be unleashed when a researcher is able to use the massive and distributed evidence embedded in these digital assets to undertake novel research and other professionals can similarly sue these assets in novel ways to support their roles. Other uses are

equally predictable – the use by curators in tracing and securing items from other collections for use in a special exhibition; the use by police in tracing stolen or misplaced artefacts, etc.

A third area of massive change that can be predicted, although with little certainty on how the changes will be manifested, is in public engagement with the content of their heritage. This is already seen in many ways, varying from engagement with wikipedia; to the massive collections of digital photographs available on the internet; to the 60,000 finds registered by the public on the UK DCMS portable finds scheme; and to the increasing number of projects in which memories are collected from people who were part of historic events later in their lives. The interaction between formally-curated versions of the past and the free-for-all of the internet has yet to mature, but one thing that is certain is that there will be change. An important part of this resolution has to be the need to address and represent different cultural perspectives on aspects of the past. The “victor’s perspective” is no longer the only perspective on the past if indeed the concept of victor is itself still pertinent in our ever shrinking world.

Finally it is predictable that the range of size of datasets will continue to rise as the equipment and techniques for creating digital artefacts and documentation improve. The explosion in the availability of images is but the tip of the iceberg in this respect.

Conclusions

In this paper we have seen the absolutely central role that education will have in shaping the cultural heritage professions’ ability to explore and steer the potential of ICTS in support of the work of future professionals. These changes will undoubtedly take time – the evidence from industries such as the games industry, architecture and others is that from the first glimmerings of potential applications to embedded tools in the professions may easily take a generation (say 25 years). ICTs in Cultural Heritage cannot be said to be in their infancy, but the general low level of education in ICTs embedded in current courses suggests that there is a long way to go.

In a world of rapidly changing technologies it remains true that the change will be ongoing, even when the idea of ICTs being an essential component of education in these fields is well embedded. One should expect that this education will need quite extensive re-examination every five years or so. One should also expect that the professions will themselves be radically altered by the advent of ICTs over the next 20 years.

Finally despite these expectations and the inevitability of change, it would be prudent for the professions to remain cautious in adopting new technologies. Technologies will come and go very fast and this process will continue. Heritage needs processes and results which survive change. Conservation remains an essential part of the way that the sector operates to protect our heritage for future generations – even in a consumer society in a digital age.

References

[Stokes, 1997] Stokes, Donald, E. (1997) *Pasteur's Quadrant: Basic Science and Technological Innovation*, The Brookings Institution, Washington (ISBN 0-8157-8177-6), pp180

[Arnold and Geser, 2007] David Arnold and Guntram Geser (2007). *Research Agenda for the Applications of ICT to Cultural Heritage*, ISBN 978-963-8046-80-2. EPOCH Publication (104pp)

[Arnold, 2007] David Arnold. (2007) "Cultural Heritage as a Vehicle for Basic Research in Computing Science: Pasteur's Quadrant and a Use-inspired Basic Research Agenda", in *Proceedings of Cultural Heritage Stream at EUROGRAPHICS 07*, (Prague Sept 3rd-7th 2007). Eurographics Association ISSN 1017-465 (pp1-8 and p57)

DIGITAL CULTURAL HERITAGE - THE SPANISH REALITY

Mercedes Farjas¹ and Juan Gregorio Rejas²

¹Universidad Politécnica de Madrid, ETSI en Topografía, Geodesia y Cartografía, Ctra. de Valencia
km 7, 28031 Madrid
Email: m.farjas@upm.es

²Universidad Politécnica de Madrid, ETSI de Caminos, Canales y Puertos, Ciudad Universitaria,
28003 Madrid
Email: rejasaj@inta.es

Introduction

All investigation begins before a question that opens the curiosity and urges to investigate in the search of answers. The present work tries to analyze a question that has been coming to us raising in European forums for a long time: How is in Spain the education on Heritage? The answer was always one, and to the purest style of the Spanish of Galicia, the question was responded with another question: “it depends, to what you talk about? to the North or the South? to university education or the formation in companies? to the present situation or the one of the new legislation?

In Spain many subjects are evolving and this situation much more is accentuated in the university world. The Agreements of Bologna have taken shelter in a change of legislation, one of whose fundamental landmarks it has been the law approved by the Cabinet of the 26 of October of 2007, by that the present titles let distribute their first course in 2010, that is to say, in two years. In the introduction of this Real Decree it is indicated¹:

¹ Real Decree by which the arrangement of the official university lessons settles down. Cabinet of 26 of October, 2007.

“Statutory law 4/2007, of 12 of April, by that Statutory law 6 /2001 is modified, of 21 of December, of universities feels the bases precise to make a deep modernization of the Spanish University. Thus, among other important new features, the Title VI of the new Law establishes a new structuring of the lessons and official university titles that allows to reorient, with a due normative sustenance, the process previously mentioned of convergence of our university lessons with the dimanantes principles of the construction of the European Space of Superior Education.

The real present decree, following the principles seated by the mentioned Law, deepens in the conception and expression of the university autonomy so that inhe successive thing they will be the own universities those that will create and propose, in agreement with the established rules, the lessons and titles that there are to distribute and to send, without subjection to the existence of a previous catalog established by the Government, like until now were forced.

Also, this real decree adopts a series of measures that, in addition to being compatible with the European Space of Superior Education, make flexible the organization of the university lessons, promoting the curricular diversification and allowing that the universities take advantage of their capacity innovation, their strengths and opportunities. The flexibility and the diversity are elements on which the proposal of arrangement of the official lessons like mechanism of answer to the demands of the society in an open context and constant transformation rests.”

Before the question of how the formation in Heritage in Spain is formed, now more than ever the answer it will have to be *“it depends”*, and it depends in greater measurement on us, whom we are working to improve and to know more close by all this science and its field of performance.

From the Group of Investigation Management of the Cultural Heritage and New Technologies of the Polytechnical University of Madrid (UPM), we have been working more than 12 years in the documentation, restoration and management of the Cultural Heritage.

We began occupying us of the archaeological deposit of Recópolis, soliciting to its director who allowed to apply our basic speciality us, the cartography, and to try new technologies. The rise on scale 1/100 of the excavated zones and on scale 1/500 of all the area of intervention was made; we continued investigating with a three-dimensional modelling of its palace by topographic techniques and its basilica by photogrammetric techniques, analyzing the power and the possibilities of both disciplines.



Image 1: Locations of projects of the Group of investigation

We moved away until Arab Emirates (U.A.E.) to transfer our experiences. There we extended the work area arriving to create cartographies on scale 1/1,000, 1/2,500 and 1/50,000, either directly with taken topographic and geodesic data in field with our students, or making cartographic existing document treatments that were happening to our hands.

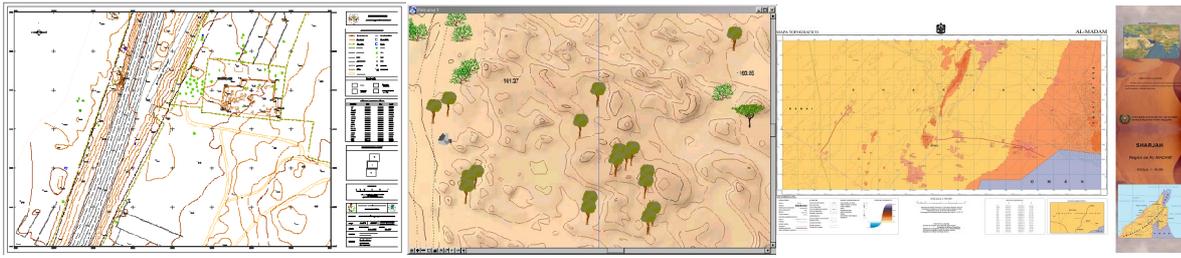


Image 2: Models of E.A.U. cartography

We obtained digital models of the land and historical monuments, and we subtly entered in the theory of architectonic reconstruction and identification of scenes of the past.

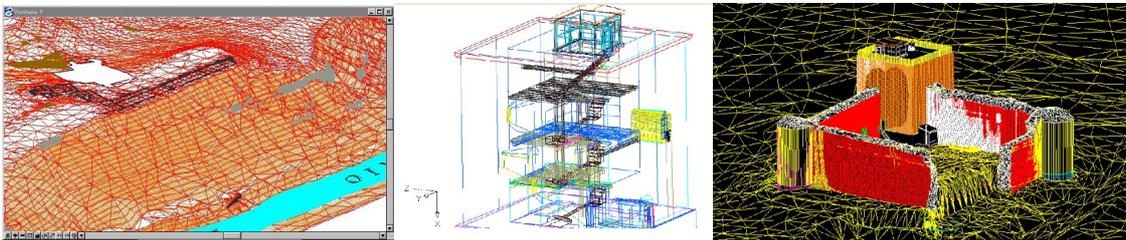


Image 3: Digital models of Recópolis and Villavellid

A challenge us to try was everything to obtain the representation of cavities, in principle underground nears space. There we became familiar with all problematic of representation of points with different level and equal planimetric coordinate, as well as with the difficulties of data acquisition with impossible equipment settings and problems of concealments. We left to the outside and we made contact with prehistoric shelters in the Pyrenees in which we tried the stations laser without prism, incorporating great geographic areas of contour and modelling the reconstruction of the landscape.

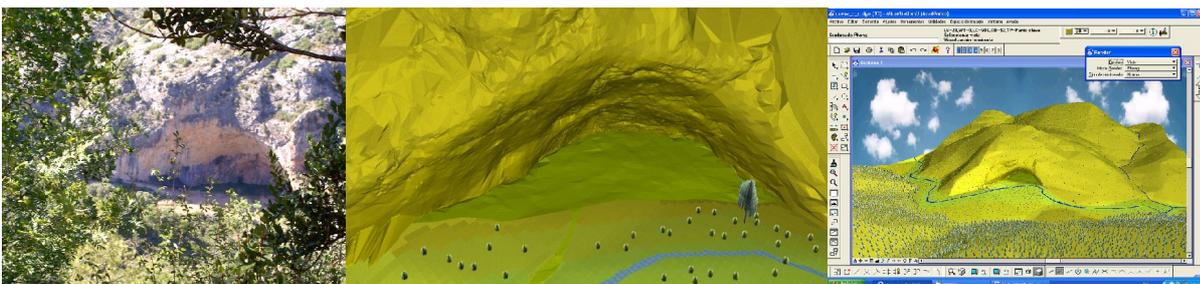


Image 4: "The Great Cave" - Prehistoric Shelter

We worked with Geographic Information Systems (GIS) for city-planning developments and alternative proposals of management of resources, and represented whole provinces to obtain thematic cartography from digital supports. Today we counted on multiple results and images that serve to us as curricula and which they define our line of work: to maintain the metric one and to enter in spreading documents and museology to us, approaching scientists and the public in general, our history and the Heritage that it has bequeathed to us.

We come from engineering and our speciality is the technologies applied to the Heritage, in Madrid, Burgos, Gerona, Ciudad Real, Salamanca, Galicia... and other places in which already we have worked and in that we continued doing it. In the situation analysis of the education of the specialists in Cultural Heritage, we counted on the additional perspective of a personal formation in Sciences of the Education of first, second and of third university level. At that time through the doctorate thesis answers looked for the question on the compared curricular analysis of the superior education in Germany and Spain and hypotheses of mobility of professionals between both countries considered, as a result of the approval of the Directive of opening of professional borders in the European Union. Now, with the present work, we looked for to obtain a first sketch, an introduction on the present situation of the formation in Cultural Heritage in Spain, first ideas that can be used for later works more objectives.

THE SPANISH SYSTEM OF EDUCATION

The educative system in Spain begins proposing the *infantile education* from the three years, education that is voluntary until the age of 6 years. From the 6 to the 12 years our students they remain during 6 years making *primary education*. When finalizing it the studies of *ESO* begin (*Obligatory Secondary Education*) that they will occupy 4 years more to him and than will allow him to accede to the *baccalaureate* at the age of 16 years. After two years of *baccalaureate*, and an entrance examination to the University (*Selectivity*) the doors of the university lessons are open.

Within superior education in single Spain the university like institution is recognized that can distribute official courses. We could consider, in main lines, three great blocks of university education in Spain, taking care of the duration of the studies. Thus we were with 4-5 studies years in specialities of Humanities and Social Sciences, 5 years in degrees of Engineering, 6 years in Architecture and some Engineering; of 3 years in the degree of Technical Engineering, and other degrees of 2 years of Second cycle of studies of superior education.

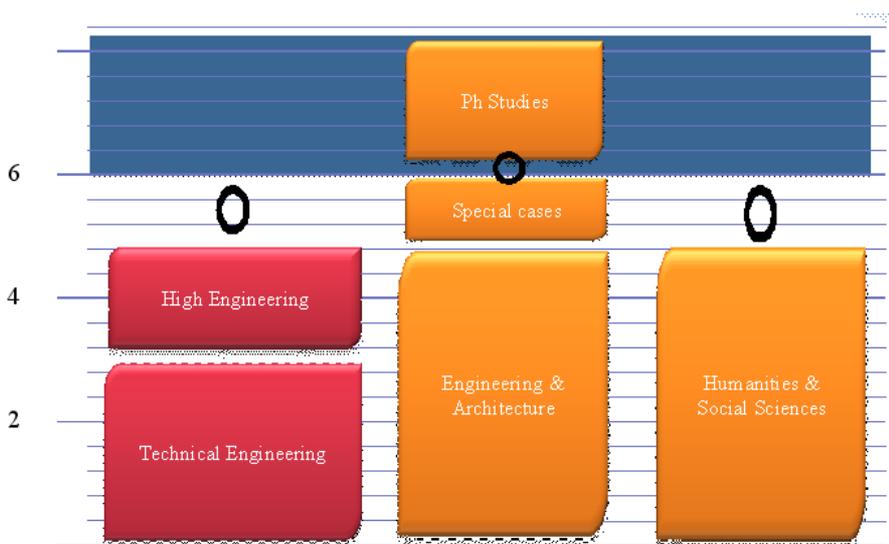


Image 5: Structure of the Spanish Educative System of Superior Education

With respect to all of them it is necessary to indicate that, according to the Additional Disposition First “Implantation of the new lessons” of the Real decree approved the past October:

“2. In academic course 2010-2011 seats will not be able to be supplied again entrance in first course for the present degrees of Graduate, Architect, Engineer, Technical Architect and Engineer Technician”

Therefore, as of the 2010 the first course of university studies with the format in the Agreement of Bologna will be only offered. The Real decree (RD) of October of 2007, indicates that the Spanish universities will distribute conducive lessons of Degree, Masters and Doctorate to the obtaining of the corresponding official courses (Article 3.1).

And in Article 3,3, it indicates that the official university lessons will take shape in condition and curricula that will be elaborated by the universities, with subjection to the norms that are to them of application in each case. These curricula will have to be verified by the authorized Council of Universities and in their implantation by the corresponding Independent Community.

Article 3,4 is interesting that expresses how the universities will be able, by means of agreement with other national or foreign universities, to organize conducive joint lessons to the obtaining of an only Graduated official degree of, University Masters or Doctor.

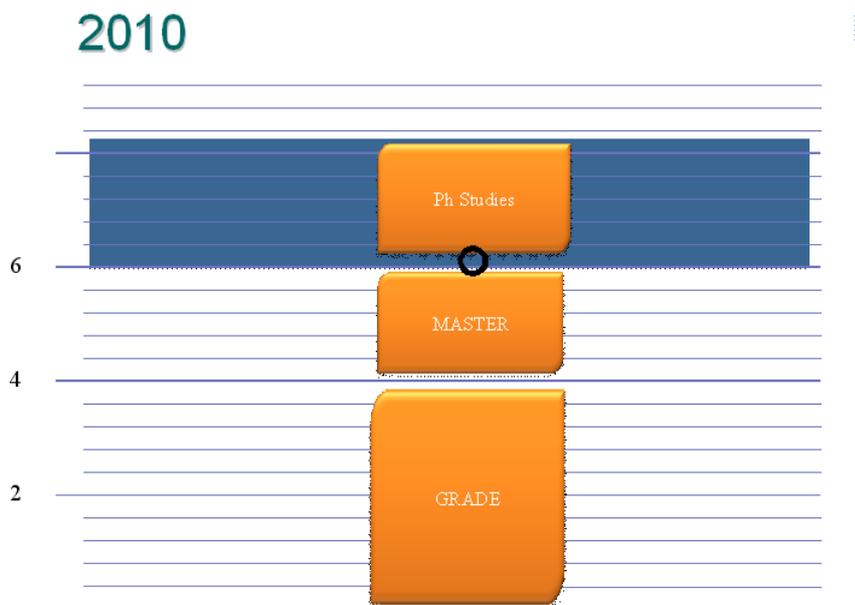


Image 6: New Educative System of Superior Education approved the 26 – 10 – 2007

FORMATION IN CULTURAL HERITAGE

The formation in Cultural Heritage in Spain, appears in postgraduated studies and general in courses of Masters. The studies of Masters, in Spain, are made after to have obtained a degree in university education and we could say that those of greater prestige have come being distributed

from enterprise organizations and deprived universities, in thematic related to the economy and the enterprise management.

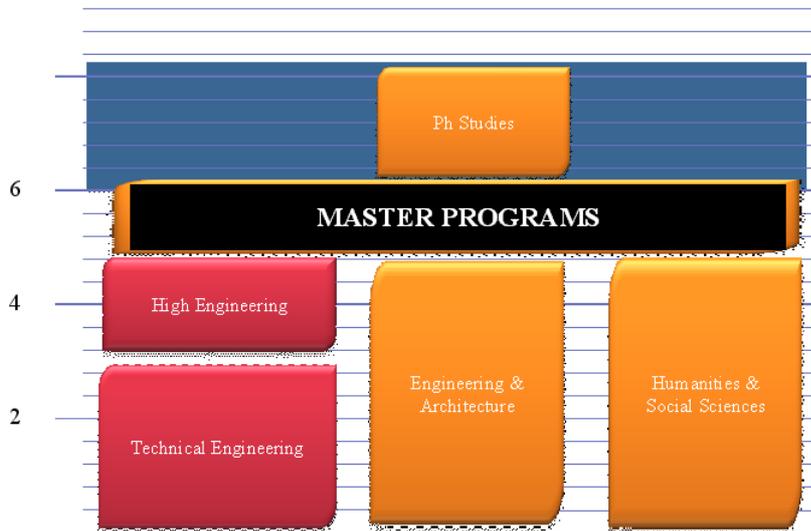


Image 7: Location of the Courses Masters in the Spanish Educative System

In the page Web <http://www.mastermas.com/> distributed programs of Masters in Spain are related that, in opinion of professionals and directors of company (and therefore with subjective character) would have to be considered like reference in their respective specialties. Related to subjects of Cultural Heritage and their spreading we can mention:

Master on *Videogames Design* (IDEC-University Pompeu Fabra, Barcelona)

Master on Animation (IDEC, University Pompeu Fabra, Barcelona)

Master on Multimedia and Internet Design (ESAC; on-line)

Master on TIC Management (E.U. La salle; Barcelona or Madrid)

Internacional Master on Turisme (ESADE, Barcelona).

Other pages of interest to know the Spanish Master are:

<http://www.tumaster.com/>

<http://www.solomasters.com/>

One first approach to the supply of Postgraduated Studies (Masters, Specialists, or Experts degrees) that the Spanish Universities have supplied, in Course 2007-2008, related to Cultural and Historical Heritage, Cultural Goods, Cultural Management and Conservation is the one that appears next ²:

Studies of the Spanish Universities. Year 2007-2008 (Postgrado: Masters, Specialists, Experts)

Historical and Cultural Heritage. Cultural Heritage. Cultural Management. Conservation

PROGRAM	UNIVERSITY	PRIVATE	CENTER	LOCATION	ADDRESS	NO PLACES
Máster Universitario en Gestión del Patrimonio	d'ALACANT	N	Departamento de Geografía Humana	Ctra. Alicante s/n	03690 SANT VICENT DEL RASPEIG (ALICANTE)	
Especialista Universitario en Gestión del Patrimonio	d'ALACANT	N	Departamento de Geografía Humana	Ctra. Alicante s/n	03690 SANT VICENT DEL RASPEIG (ALICANTE)	
Máster Universitario en de Gestión Turística del Patrimonio Natural y Cultural	BARCELONA	N	Escuela de Hostelería y Turismo-CETT	Av. Can Marcet, 36-38	08035 BARCELONA	
Diploma de Postgrado en Cooperación y Gestión Cultural Internacional	BARCELONA	N	Facultad de Ciencias Económicas y Empresariales	Avda. Diagonal 690	08034 BARCELONA	
Máster Universitario en de Cultura Histórica y Comunicación	BARCELONA	N	Facultad de Geografía e Historia	Baldiri Reixac s/n	08028 BARCELONA	
Experto en Gestión Virtual del Patrimonio	BARCELONA	N	Instituto de Formación Continua. IL3	Ciutat de Granada 131. Ed IL3. Distrito 22	08018 BARCELONA	
Máster Universitario en Gestión Cultural	CARLOS III DE MADRID	N	Centro de Ampliación de Estudios. Postgrados	Edif. Luis Vives. Campus Getafe. c/ Madrid, 126	28903 GETAFE (MADRID)	40
Magister en Gestión del Patrimonio Cultural	COMPLUTENS E DE MADRID	N	Centro de Estudios de Gestión,	Edificio B. Mas Ferré. Campus de	28223 MADRID	25

² <http://cv1.cpd.ua.es/EstudiosXXI/0ESTU0/SU2PPESIIIEE1/ST210433/index.html>

			Análisis y Evaluación	Somosaguas			
Máster Universitario en Gestión Cultural	de GRANADA	N	Departamento de Historia del Arte	Campus de la Cartuja	18071 GRANADA		41
Máster en Gestión de Instituciones Culturales	Internacional de Catalunya	S	Facultad de Humanidades	Campus Iradier Inmaculada 22	08017 BARCELONA		
Curso de Especialización en Gestión del Patrimonio Cultural Local	JAUME I	N	Centre d'Estudis de Postgrau i Formació Continuada	Campus del Riu Sec	12071 CASTELLÓN DE LA PLANA		
Experto Universitario en Guía Intérprete del Patrimonio Natural y Cultural de Canarias	de LAS PALMAS DE GRAN CANARIA	N	Unidad de Gestión de Investigación; Subdirección de Tercer Ciclo y Postgrado	C/ Murga, 21	35003 LAS PALMAS DE GRAN CANARIA (LAS PALMAS)		30
Postgrado en Gestión Cultural	de LLEIDA	N	Departamento de Geografía y Sociología	Plaça Víctor Siurana, 1	25003 LLEIDA		
Especialista Universitario en Gestión del Patrimonio Etnológico, Turismo y Desarrollo	MIGUEL HERNÁNDEZ D'ELX	N	Centro de Formación de Postgrado y Formación Continua	Edif. Torrevalillo. Avd. Ferrocarril, s/n	03202 ELCHE (ALICANTE)		30
Máster en Interculturalidad en el País Vasco	Mondragon Unibertsitatea	S	Facultad de Humanidades y Ciencias de la Educación	Barrio Dorleta, s/n	20540 ESCORIATZA (GUIPÚZCOA)		
Experto en Interculturalidad en el País Vasco	Mondragon Unibertsitatea	S	Facultad de Humanidades y Ciencias de la Educación	Barrio Dorleta, s/n	20540 ESCORIATZA (GUIPÚZCOA)		
Postgrado en Gestión Cultural	Oberta de Catalunya	S	Punto de Información Postgrado	Avda. Drassanes, 3-5	08001 BARCELONA		
Máster en Conservación, Gestión y Difusión del Patrimonio	Oberta de Catalunya	S	Punto de Información Postgrado	Avda. Drassanes, 3-5	08001 BARCELONA		
Especialista Universitario en Gestión Cultural	de OVIEDO	N	Vicerrectorado de Convergencia Europea, Postgrado y Títulos Propios. Unidad de Títulos Propios	C/.Plaza de Riego s/n. Ed. Historico, 2ª planta	33003 OVIEDO (ASTURIAS)		40

Curso de Especialización en Conservación y Restauración del Patrimonio Arquitectónico y Urbano: Teoría, Historia y Documentación	POLITÉCNICA DE MADRID	N	Escuela Técnica Superior de Arquitectura	Avda. Juan de Herrera s/n	28040 MADRID	
Diploma de Postgrado en Dirección y Gestión de Instituciones, Empresas y Plataformas Culturales	POMPEU FABRA	N	Instituto de Educación Continua	Balmes 132	08008 BARCELONA	
Postgrado en Comunicación de la Tradición y la Oferta Cultural	Ramón Llull	S	Facultad de Ciencias de la Comunicación Blanquerna	Valldonzella 23	08001 BARCELONA	
Postgrado en Gestión y Didáctica del Patrimonio Cultural	Universitat Ramon Llull	S	Facultad de Filosofía de Catalunya	Diputació 231	08007 BARCELONA	
Especialista Universitario en Gestión Cultural	ROVIRA I VIRGILI	N	Departamento de Antropología Social y Filosofía	Plaza Imperial Tarraco 1	43005 TARRAGONA	
Máster en Evaluación y de Gestión del Patrimonio Histórico	SALAMANCA	N	Centro de Estudios Propios y Postgrados	Patio de Escuelas, 3	37008 SALAMANCA	45
Máster Europeo en Conservación y Gestión de Bienes Culturales	de SALAMANCA	N	Centro de Estudios Propios y Postgrados	Patio de Escuelas, 3	37008 SALAMANCA	20
Máster en Renovación Urbana e Rehabilitación	de SANTIAGO DE COMPOSTELA	N	Facultad de Geografía e Historia	Plaza de la Universidad 1	15782 SANTIAGO DE COMPOSTELA (A CORUÑA)	
Tercer Master Universitario Europeo en Arte, Cultura, Conservación y Gestión de Bienes Culturales	de SEVILLA	N	Vicerrectorado de Postgrado y Doctorado	Pabellón de México. Avda de la Palmera s/n	41013 SEVILLA	30
Experto Universitario en Gestión y Economía de la Cultura	de SEVILLA	N	Vicerrectorado de Postgrado y Doctorado	Pabellón de México. Avda de la Palmera s/n	41013 SEVILLA	40
Master Univeristario en Gestión Cultural	de SEVILLA	N	Vicerrectorado de Postgrado y Doctorado	Pabellón de México. Avda de la Palmera s/n	41013 SEVILLA	40

Máster Universitario en U.N.E.D Mediación y Gestión de Patrimonio en Europa	N	Fundación General	C/ Francisco de Rojas,2 2º dcha.	28010 MADRID	
Diploma en de VALÈNCIA Manifestaciones Culturales, Museos y Exposiciones Científicas, Marketing y Comunicación	N	Departamento de Historia de la Ciencia y la Documentación	Avda. Blasco Ibañez 15	46010 VALENCIA	
Máster Universitario en de Administración de VALLADOLID Indusrias Culturales	N	Escuela Universitaria de Estudios Empresariales	Prado de la Magdalena s/n	47005 VALLADOLID	40
Máster en Gestión de Políticas y Proyectos Culturales	N	Facultad de Filosofía y Letras	Pedro Cerbuna 12	50009 ZARAGOZA	35

PRELIMINARY CURRICULA AND ANALYZES

In the analysis of the curricula, we stop in the relation between the new technologies and the systems of management, representation and documentation of the Cultural Heritage, and in the contents of the education programs. The Masters that is supplied is compound of Modules, with an assigned number of credits (ECTS or credits of the legislation Spanish) and distributed in subjects. If we join the subjects in four categories: specific subjects of Heritage, subjects that analyze subjects related to Humanities, subjects of education of technologies, subjects that complement the formation with contents of local territorial order; we could obtain the graphs that are included next.

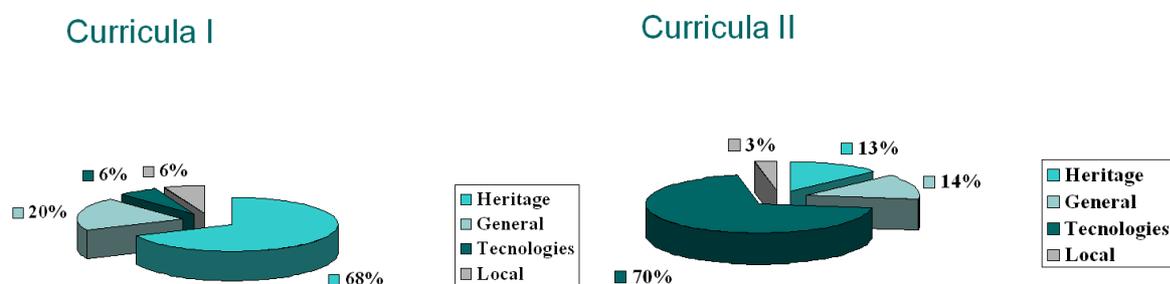


Image 8: Compared Curricula of Masters in Cultural Heritage

In this sense, in a Masters of Heritage offered by a Department of Archeology or History it is invited to participate to a person or group of investigation that works in technologies, and the opportunity offers to offer a subject or several, teaching or showing applications of that technology. If interest in another technology is had it invites another specialist, of that same university or another one. To the inverse one, if the Masters is offered by a Department of Engineering or Architecture, as a secondary professor and for educational complement, it will be invited to somebody expert in Cultural Heritage from the Humanities, that contextualise the concept of Heritage.

This sample a first fact in the relation between new technologies and Cultural Heritage: depending on the University and the Department that the Masters supplies, curricula bases and its Social structure on matters of Humanities and Sciences, or on the experimental technical formation, that is

to say, in formation in the technologies. In general, in relation to new technologies of documentation, we found with categories very different from Masters in Heritage, that offers formation that is neither additional nor complementary, but that are not known to each other.

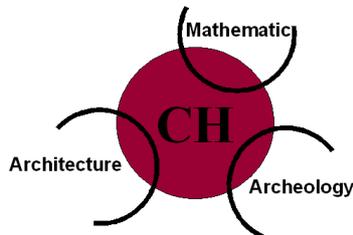


Image 9: Different points of view for different specialities in Cultural Heritage

The multidisciplinary is understood like a sum of partial approaches disconnected, in technologies, as much problematic and necessities, like in formation objectives. We have been using this in different scenarios incorporating our participation in any field work. Special We want to point out this collaboration developed with the Research Group in the Celtiberian site of Segeda directed by Dr Francisco Burillo. The leadership of this archaeologist ace well possible ace his efforts to build an interdisciplinary team had made to long lasting exchange of knowledge which there are finally generated new processes in documenting and treating archaeological information.

Segeda was an important enclave in the battles between the Romans and the Iberians for the control of the Iberia Peninsula. The Roman strategy to win the war needed a change in the calendar which made the new year start in January and not in March as traditionally happened. This decision made a change in the routemap and in the history. A little while, an opportunity and a great decision that change the political moment and our destiny, celebrating the beginning of the year the 1 of January, then and now. A strategy adopted by the people in charge from an approach to inter discipline has to decide curricula from a clear definition of necessities and objectives, being analyzed and deciding the degree of interconnection between both disciplines (Heritage/Technologies).

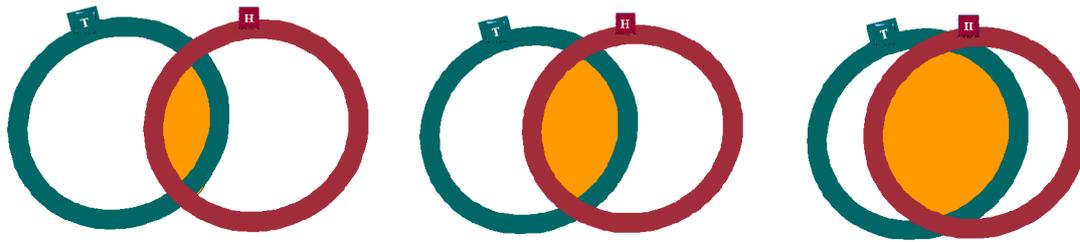


Image 10: Interrelation between New Technologies and matters of Humanities

Whatever curricula that is decided at international level, national or local, to answer to specific and general objectives, that are to be established counting on the points of view and exposition of representatives of sciences and institutions implied in the patrimonial management.

CONCLUSIONS

This document presents the approach adopted by the Universidad Politécnica of Madrid (UPM) *Research Group on Cultural Heritage Management d New Technologies* throughout 15 years of experience collaborating in archaeological and Heritage projects. The UPM Research Group foresees the future of Heritage Management incorporating new disciplines. However the process should follow a responsible plan and not the occasional use of resources at isolated sites. Field directors and Heritage Management professionals should seat together to state the goals, structures and team that should collaborate in any documentation project.

From our first visit to an archaeological site we have been implementing degree projects in the curricula of the *Escuela Técnica Superior de Ingenieros en Topografía, Cartografía y Geodesia*, by obtaining cartography at 1/100, 1/200, 1/500 and 1/1.000 scales, achieving thematic mapping from existing information and images from the remote sensing, as well as 3D modelling of sites using traditional equipment, GPS and photogrammetry. After briefly explaining this work and how mapping sciences has begun to be used in any archaeological research project, we present our experience and results, showing the need of a dialogue between new technologies and archaeological research. Chance opens new opportunities but conscience and analysis will help us

to find the sense of the search. The Spanish situation allows a great flexibility in the exposition of the formation in Cultural Heritage, as well as starting up national and international programs. In any case he is a little while optimal for a curricular analysis and the design of objectives.

DIGITAL ARCHAEOLOGY CURRICULA: SOME ASPECTS OF THE STATE OF PRACTICE IN FRANCE AND TOURS UNIVERSITY EXPERIENCES

Elisabeth Lorans

Laboratoire Archéologie et Territoires (UMR 6173 CITERES, Université de Tours-CNRS)

Email: elisabeth.lorans@wanadoo.fr

This paper is divided into two main sections. The first one provides information regarding the development of interdisciplinary curricula in archaeology and architectural studies in France; it is not a systematic survey but it insists on some of the main actions in favour of such development. The second one presents the archaeological curriculum offered by Tours University, insisting on digital tools and on the strong links between teaching and research within the “Laboratoire Archéologie et Territoires”.

1. Some aspects of French state of practice in digital humanities applied to archaeology and architectural heritage

1.1. A limited teaching in first degrees and master degrees

Regarding the situation in France, the main point to underline is the fact that very few universities offer curricula which associate humanities and digital tools in first degrees or even in master degrees, although many degrees deal with archaeology, art history and, more recently, cultural heritage. This appears from a preliminary survey of many curricula offered in these fields which have been listed by the National Institute of Art History (INHA; http://www.inha.fr/rubrique.php3?id_rubrique=237).

All together, this kind of teaching is offered in places where there is a close connection between teaching and research developed by teams belonging to the National Centre of Scientific Research

(CNRS). Apart from the example of Tours (*cf. infra*), one can point out the team MAP (for “Modèles et simulations pour l’Architecture, l’urbanisme et le Paysage”, i.e. Models and simulations for architecture, urbanism and landscapes; (<http://www.map.archi.fr/>). This research team is mainly based in Marseille within the local school of Architecture but it also includes members based in other towns, like Nancy.

This research team plays an important part in developing teaching on architectural models through various types of actions, mainly a post-graduate degree, entitled “Digital world and Architectural Heritage”, on one hand and summer schools on the other.

1. 2. The leading action of the National Centre of Scientific Research: the creation of three complementary networks in humanities and Social Sciences

Beyond these few examples of specific training, one should insist on the leading action of the National Centre of Scientific Research (CNRS) which clearly appears through the creation and the development of three complementary networks: ISA, MoDys and M²ISA (slide 6). The first two ones, ISA and MoDys, are based on collaboration between archaeologists and geographers and play an important part in the formation of doctoral students and archaeologists of various functions. Both of them are run from Tours University where their web sites are developed and maintained.

- ISA, « Information Spatiale et Archéologie » (<http://isa.univ-tours.fr>)

The purpose of the network ISA is to gather up geographers and archaeologists who are used to geomatic in order to enable:

1. the definition of new research topics concerning the past societies;
2. the transfer of geographical concepts into the field of archaeology;
3. the use and distribution of geomatic in the various professional environments of archaeology.

In order to reach this purpose, the network offers several sorts of actions:

1. collecting information regarding geomatic applied to archaeology;
2. organizing conferences and seminars every year;
3. developing cooperation between research teams to apply to national or European projects regarding the development of new methodologies.

This network therefore offers both a research and a training environment for archaeologists, including doctoral students. In June 2007, the first international summer school was organized by ISA in Tours, devoted to Time, space and the dynamics of change in archaeology (<http://isa.univ-tours.fr/index.php>). Finally, this network also offers regular teaching for professionals, organizing short sessions mainly devoted to the use of the software ArcGis and of GPS.

- The second network, MoDys, “Modélisation et Dynamiques Spatiales”, is an interdisciplinary network created by the CNRS in order to develop the use of spatial models within humanities and social sciences and to encourage interdisciplinary work (<http://modys.univ-tours.fr>). Many different bodies involved in various aspects of archaeology but also in other sciences belong to this network. MoDys organizes every year a seminar for doctoral and post-doctoral students; the first one took place in 2006 and included mainly archaeologists and geographers but the next one, organized in December 2007, was more largely open to other disciplines. The proceedings of both sessions are available on the web site (<http://isa.univ-tours.fr/modys/rencontre.php?liste>).

- The third and last network to mention, CRN M²ISA (« Centre de Ressources Numériques Méthodologies pour la Modélisation de l'Information Spatiale Appliquée aux Sciences de l'Homme et de la Société ») provides digital data for spatial analysis within humanities and social sciences (<http://isa.univ-tours.fr>).

The unit “Archéologie et Territoires” plays an important part in the first two networks because of the early development of research in that field in Tours, which makes possible to offer students a coherent curriculum associating digital tools with archaeological training.

2. Teaching and research in archeomatic at Tours University

2.1. Overview of the curriculum

Since 1998, Tours University offers a complete curriculum in archaeology, from the first degree up to doctoral thesis. This curriculum is strongly connected with the main aspects of our research programmes which put the emphasis on the relationships between past societies and space (<http://univ-tours.fr/lat>). Therefore, students are trained to the use of DBMS and GIS from the third year onwards, when they specialise in archaeology after reading mainly history or art history in the first two years with optional classes in archaeology and field training. Within the first degree, students are provided with 24 hours of practical teaching on DBMS and on GIS, using respectively the softwares 4th Dimension and Mapinfo.

The Master degree is two years long and offers a choice for the second year: either students choose a research master, which may allow them to do a thesis afterwards, or they choose a professional master which is meant to be their last degree and to give them the possibility of getting a job at the end of it. In both cases, students are trained to use digital tools which have been experienced and developed mainly within our research unit and the networks mentioned above.

Master 1: 24 hours of lecture re DBMS and statistics; 24 hours of practical work in geomatic applied to archaeology (GIS with the software ArcGis).

Master 2 Research: computer sciences and geomatic applied to archaeology (24 hours of lecture and 24 hours of practical work).

As for the professional Master “Archéomatique”, it trains students to the use of digital tools for archaeological data management from field work up to final dissemination of results in various ways. Students spend five months at university to follow theoretical and practical classes and then four months in an archaeological unit or research team to develop a project regarding one of the main topics of their curriculum, in other words one of the main stages of the archaeological process:

- field data management;
- spatial analysis;

- dissemination of knowledge.

These main topics are studied through eight teaching sessions, including one or two shared with the research master.

The following sections will illustrate the main aspects of teaching DBMS, GIS and electronic dissemination through examples developed in Tours and, for the last section, in Nanterre as well.

2.2. Field data management: DBMS ArSoL

For the first three stages of the archaeological data management, i.e. initial recording, processing and storage, the main tool developed in Tours is a DBMS called ArSoL, meaning “Archives du Sol” (Galinié *et al.* 2005). http://citeres.univ-tours.fr/doc/lat/pecada/F2_17.pdf). It includes three main data bases:

- *Archives de fouilles*: deals with the analysis of the stratigraphy of excavated sites, and incorporates a GIS at that same scale;
- *BaDoC* (“Base de Données Céramiques”): records the data related to pottery both to provide chronological information on the excavated sites and to study pottery production and distribution as such;
- *BaDoA* (“Base de Données Anthropologiques”): deals with the human remains to analyse the ways cemeteries were used and to study the biology of past populations.

This recording and processing system is used by members of our research unit for their own excavations but also by other colleagues, mainly those involved in rescue archaeology. At the moment, we are working to make this data base available on the web, so that one could have access to it from outside university either to add information re one specific site or to get data re one specific topic.

2.3. Spatial analysis: the development of GIS

Spatial analysis is another important aspect of the training offered to students in Tours, from the first degree onwards, using first the software Mapinfo and then ArcGis. Most spatial analyses are based on two dimensions data but more recently we have been developing research to include three dimensions data.

2.3.1. Two dimensions data

Many master and doctoral students develop GIS to study the transformation of urban space or rural landscapes over a long period of time – what is commonly called, even in English, the “longue durée” – integrating in the same data base a large diversity of information: archeological and architectural data, written sources and plans (Histoire et Mesure 2004; Portet 2006; Rodier 2006).

One example of this digital tool is offered by the GIS ToToPi (“**TO**pographie de **TO**urs **Pré-Industriel**”) which has been developed by Henri Galinié and Xavier Rodier since 1996 to study the transformation of Tours from the early stage of the city in the first century AD until the end of the 18th century (Galinié, Rodier 2002; Galinié, Rodier, Saligny 2004; Rodier, Saligny 2007; 2008). This GIS makes it possible to spatialize archaeological data at various scales: excavated sites, sections of the urban space or the whole town. Four main kinds of research can be done:

- at the scale of excavated sites, field data are recorded and processed in connection with the DBMS ArSoL (*cf. Supra*);
- at the scale of the whole town, another three requests are possible:
 - Historical topography using thematic and chronological data;
 - Urban morphology, based on the automatic study of orientation of plots;
 - Evaluation of archaeological deposits through modelisation.

2.3.2. The recent integration of 3D data into GIS

In other words, this GIS allows various types of request, producing both thematic maps and spatial models, in two dimensions but also now in three dimensions. One can provide two examples of these more recent approaches.

Firstly, for an exhibition organised in 2006 to present the main results of the last 40 years of archaeology in Tours, several modelisations were elaborated (Galinié 2007: 43):

- buildings around 1850;
- underground destructions;
- excavated volumes.

They are simplified models in 3D which were associated together to show the relationships between these different kinds of information.

Secondly, at a larger scale, recent work was developed by a doctoral student, Bastien Lefebvre, to include architectural data within the urban fabric in order to express the spatial changes in a specific part of the city where the houses of the canons of the cathedral were built in the Middle Ages on top of the former roman amphitheatre (Lefebvre 2006). Based on the model of the GIS ToToPI, a new method of modelisation both in plan and volume was elaborated. It allows various kinds of requests:

- in plan, representation of the stability or changes of urban functions;
- in 3D, topographical information for a certain period of time, here the reconstruction in a simplified way of the studied area in the 18th century;
- in 3D as well, a representation of the variations of the reuse of architectural remains over a long period of time.

2.4. Dissemination: electronic publications and web sites

Finally, dissemination. Within the curriculum of the professional master “Archéomatique”, dissemination of data and results, last stage of the research process, is treated through two main digital tools: electronic publications and web sites.

2.4.1. Electronic publications

The module re electronic publications, organized in collaboration with the Arkeotek Project directed by Valentine Roux (CNRS, Maison de l'Archéologie et de l'Ethnologie, Nanterre), trains students to the use of new writing practices inspired by the [logicist program](#). These new practices are developed by Arkeotek which is a European association bringing together specialists in the archaeology of techniques and technology (<http://www.arkeotek.org>). Arkeotek is strongly engaged in innovative publication projects designed to improve the dissemination of knowledge throughout the community through a new electronic format, known as [SCD format](#) (Scientific Constructs and Data).

To reach this purpose, Arkeotek created two different kinds of publications:

- [The Arkeotek Journal](#), the first scientific journal in the SCD format allowing a rapid lecture of scientific constructs and the exhaustive publication of research data;
- A collection of SCD-formatted monographs, known as the [Référentiels collection](#), which does not deal only with the archaeology of techniques; for example, this format was adopted for the final publication of the site of Rigny (Indre-et-Loire), a medieval and modern cemetery and rural settlement excavated by E. Zadora-Rio and H. Galinié, which will come out in 2008.

2.4.2. Multi-media tools: ICERAM, a DBMS on Medieval and modern pottery production

The purpose of this website, created under the supervision of Philippe Husi, is to provide data on Medieval and modern pottery production and distribution, which is an essential part of the archaeological process (<http://iceramm.univ-tours.fr/>). It makes it possible to disseminate more quickly information re a large quantity of artefacts which often times remain unpublished. This is reached through two data bases:

- a bibliographical data base;
- a data base on pottery which includes three types of information:
 - the location of the studied site within the parish;

- the date of the studied group of pottery based on stratigraphical data and on dated artefacts of other kinds;
- the typology based on the shape and on the fabric identified through drawings and macroscopic photographs.

So, this data base allows identification of pottery production and exchanges within northern France and Belgium and might be connected in the future with similar data bases in England and Netherlands.

Conclusions

In conclusion, Tours University, at the moment, has a leading position in the training of students in the field of digital tools applied to archaeology, mainly through DBMS and GIS, which have been developed within the framework of our research programmes re the relationships between past societies and space. These tools cover the whole stages of research from collecting field data to final dissemination of knowledge.

So far in France, as far as digital humanities are concerned, there is a large gap between first degrees and even master degrees on one hand, and doctoral or post-doctoral research on the other. Teaching in this field is still very limited in the first three years, or even in the five first years, whereas the summer schools organized by various research units and networks provide an adequate training to doctoral students and professional archaeologists.

Therefore, it is necessary to develop this kind of training within the framework of the first degree, which is currently done in several universities, like Nice or Dijon and Besançon, under the supervision of members of the National Centre of Scientific Research involved in this kind of work. International collaboration should be developed at master and doctorate levels through various actions: thematic workshops like the one organized by the network ISA, but also long term projects involving students who would go abroad for a certain period of time.

A strong degree of collaboration can be reached by the creation of European research units such as those created by the CNRS called EAL (European Associated Laboratories). One of them was

created in February 2007 between the University of Besançon and Slovenia. The LEA ModeLTER (Modelling of Landscapes and Territories over the Long Term) will study landscapes and territories in the last few thousand years to provide data and models for sustainable development. One can hope that similar initiatives will be taken within European countries to develop international cooperation, both in training and research.

Bibliography

Galinié, Rodier 2002

Galinié H. et Rodier X., ToToPi, un outil d'analyse urbaine, *Les petits cahiers d'Anatole*, 11, 2002: http://www.univ-tours.fr/lat/pdf/F2_11.pdf.

Galinié, Rodier, Saligny 2004

Galinié H., Rodier X. et Saligny L., Entités fonctionnelles, entités spatiales et dynamique urbaine dans la longue durée, *Histoire et Mesure*, XIX-3/4, 2004: 223-242.

Galinié *et al.* 2005

Galinié H. *et al.*, ArSoL, la chaîne de gestion des données de fouille du Laboratoire Archéologie et Territoires, *Les petits cahiers d'Anatole*, 17 (27/05/2005), 2005: http://www.univ-tours.fr/lat/pdf/F2_17.pdf.

Galinié 2007

Galinié H. (ed.), *Tours antique et médiéval. Lieux de vie, temps de la ville : 40 ans d'archéologie urbaine*, Tours, FERACF, 2007 (Supplément à la Revue archéologique du Centre de la France, 30; numéro spécial de la collection Recherches sur Tours).

Histoire et Mesure 2004

Système d'Information Géographique, Archéologie et Histoire, *Histoire et Mesure*, XIX, n° 3/4, 2004.

Lefebvre 2006

Lefebvre B., Construction et déconstruction de l'espace urbain : une modélisation en volume du bâti urbain, *MIA Digital Journal*, vol. 0, n° 2, p. 53-58 (<http://www.map.archi.fr/mia/journal>).

Portet 2006

Portet P. (ed), Les systèmes d'information géographique, *Le Médiéviste et l'ordinateur*, 44, 2006.

Rodier 2006

Rodier X. (ed.), Dossier « L'archéologie en cartes », *Mappemonde*, n° 83, 3-2006 (<http://mappemonde.mgm.fr/>).

Rodier, Saligny 2007

Rodier X. et Saligny L., Modélisation des objets urbains pour l'étude des dynamiques urbaines dans la longue durée, in Batton-Hubert M., Joliveau T., Lardon S. (dir.), SAGEO 2007, *Rencontres internationales Géomatique et territoire, Clermont-Ferrand 18-19 juin 2007*. CdRom. Série : Aménagement du territoire, AgroParisTech-ENGREF, 2007, ISBN : 978-2-85710-078-2, <http://www.emse.fr/site/SAGEO2007/CDROM/p34.pdf>

Rodier, Saligny 2008

Rodier X. et Saligny L., Social features, Spatial features and Time features: An urban archaeological data model, *CAA 2007, Computer Applications and Quantitative Methods in Archaeology*, Berlin, 2008 (forthcoming).

DIGITAL CULTURAL HERITAGE – THE GREEK REALITY

Maria Economou and Alexandra Bounia

Assist. Professors, Department of Cultural Technology and Communication, University of the Aegean

Emails: m.economou@aegean.gr, abounia@ct.aegean.gr

Introduction

The revolution in informatics and telecommunications has led us to the information society and has changed the structure and content of “cultural industries”. It has provided new possibilities for artistic creation and new forms of communication. The increasing use of information and multimedia technologies influences more and more the way people approach culture and understand cultural content. Contemporary technological achievements are redefining the traditional role of museums and organizations managing the documentation and display of cultural heritage to the public.

Most European governments have established, or try to establish, strategies for delivering new learning opportunities both to conventional education systems and most importantly to lifelong learners in less conventional settings. One of the areas for lifelong learning that have been identified is cultural heritage, as it has proven to be an area of interest and learning pursued with enthusiasm by every sector of society. Developments in this area have also been encouraged by the European Union which supports research and technological development in order to expand the contribution of libraries, museums and archives to the emerging culture economy. To meet this demand cultural heritage institutions particularly have to rethink traditional approaches to managing and disseminating information about their collections.

This paper derives from practical experience in exploring new approaches for managing and sharing museum information and in developing curricula in the newly formed field of “cultural technology” at the University of the Aegean in Greece. It is going to focus in particular on the development of undergraduate and postgraduate curricula on Museums, Heritage and New Technologies. The

particular characteristics of our programmes will be discussed in detail, along with the difficulties we faced (and still do) in our attempt to shape them. Then we are going to focus in the incorporation of ICT in the humanities and social sciences at other Universities and departments in Greece, presenting the results of a small survey we did on this subject. Finally, we will suggest alternative approaches to curricula building in the field of Cultural Heritage and New Media.

The University of the Aegean

The University of the Aegean was founded in 1984 and is one of the newest universities in Greece. It consists of 17 departments. The administration of the University is based in Mytilene (Lesvos), while departments are located on the islands of Lesvos, Chios, Rhodes, Samos and Syros, thus creating a network university covering every prefecture of the Aegean Sea.³

The University encourages the development of new cognitive areas and scientific fields and aims towards the organization of research activities on different Aegean islands in order to create the appropriate conditions for local development in important fields of social and cultural value. The academic objective of the University is to demarcate contemporary directions on chosen fields of the Higher Education that will keep pace with the development of the Greek society within a “new global village”.

The Department of Cultural Technology and Communication

The Department of Cultural Technology and Communication (DCTC) of the University of the Aegean was founded in 2000.⁴ It belongs to the School of Social Sciences and is located on the island of Lesvos, in Mytilene. It covers the field of Cultural Studies with a special emphasis on culture and cultural heritage, communication, promotion of cultural products and cultural administration.

³ A presentation of the University and its departments is available at <http://www.aegean.gr>

⁴ The Department is presented in detail at <http://www.aegean.gr/culturaltec>

It aims to educate people capable of responding to the contemporary needs of society and economy that derive from the rapid development of Information and Communication Technologies. The Department responds to the needs of “digital culture” and aims to combine Cultural Studies with the new digital technologies of image and sound to create a new autonomous scientific field as a distinguishable cognitive area. This new area could be a “common meeting point” of specialists from different cognitive fields, such as Social Sciences, Humanities and Informatics. The advantage of such a combination is the promotion of scientific knowledge under a new theoretical and methodological approach that will unify the scattered scientific production to contemporary cognitive areas.

Undergraduate studies at DCTC

Undergraduate studies at DCTC comprise of eight (8) semesters. During the first four (4), the core courses cover the field of cultural studies as well as of Informatics and Multimedia. In the 5th semester the students select and attend one of the four offered study divisions with a duration of 4 semesters: a) museology, b) digital audiovisual arts, c) cultural representation, performance and design, and d) educational technology and intercultural communication. The contents of each division cover the epistemological issues of the division’s main field in combination with specialised training in the use of multimedia applications and informatics. At this level (during the 3^d and 4th year of study), the programme includes core modules, as well as optional and elective ones. In parallel to one of the study divisions, students have to attend one of three informatics cycles (such as Programming of Multimedia Applications, Databases, or Object-Oriented Programming). They can also undertake practical work training during the summer of either their 3^d or 4th year. During this last year, they can opt to write a degree dissertation.

The table below presents briefly the structure of the courses of one of the study divisions closer to cultural heritage, the Museology one.

Museology Study Division (3d and 4th year of Undergraduate Studies)		
5th Semester		
Core Courses:	Art History I	Informatics Cycle:
	Museology I	Programming of MM Applications I
	Introduction to Museum Education	Databases
	Interactive Computer Design	Object Oriented Programming I
Restrictive Electives	Communication policies of contemporary museums	
	Sound I	
	History of Sciences	
	Preservation of Natural and Human Environment	
Optional	Geographical Information Systems	
6th Semester		
Core Courses:	Art History II	Informatics Cycle:
	Museology II	Programming of MM Applications II (C)
	Applied Museum Education: museums & schools	Computer Networks (RE)
Restrictive Electives	Virtual Museum	3D Graphics (RE)
	Narrative techniques for audiovisual productions	Data mining (RE)
	Sound II	
	European policies for culture	
	The industry of tourism	
	Summer work placement	
7th Semester		
Core Courses:	Exhibitions organisation	Informatics Cycle (RE):
	Environmental parameters of museums	WWW technologies (RE)
	Management of collections and cultural organisations	Data security in Info Society (RE)
Restrictive Electives	Creation and development of museums	Virtual Reality (RE)
	Management of museums & cultural organisations	
	Musical culture	
	Final year dissertation	
8th Semester		
Core Courses:	Special Issues in Museum Education	Informatics Cycle:
Restrictive Electives	History & theory of photography	Software technology (C)
	The culture of comics	Special Issues in Educational Technology (RE)
	Theory and design of digital games	
	Final year dissertation	

Postgraduate studies at the DCTC

In addition to its under-graduate programme, the Department offers a series of interdisciplinary graduate programs, organized and run either by the Department's own resources or in collaboration with other Universities.

1. *M.Sc. in Cultural Informatics*

The Department offers an interdisciplinary graduate program in the field of Cultural Informatics leading to a Master of Science. The program is further divided into two divisions: (a) Museology and (b) Design of Digital Cultural Products.⁵

It provides both theoretical expertise and hands-on experience through seminars and laboratories. In greater detail, the objectives of the post-graduate programme are:

- The promotion of scientific knowledge and research in the field of Cultural Informatics
- The development of new research directions in the field of Informatics
- The provision of quality graduate education in significant fields of national interest, such as the formation of cultural policies
- The offer of up-to-date knowledge & training that serves well the needs for recording and promoting cultural heritage
- The contribution in the development of national economic and technological policies in accordance to international standards within the global information world
- The creation of an international academic community by the cooperation of faculty with visiting professors and by the admission of international students.

The programme offers a total of fourteen courses in both divisions. To successfully complete the M.Sc requirements, students need to pass a total of eight core courses and two electives.

	Museology Division	Design of Digital Cultural Products Division
1st Semester		
Core Courses:	Contemporary Museology	Cultural Representation
	Digital media in Museum Education	Graphic Design
	Museum Information Systems	Interaction Design
	Interactive Computer Design	Cultural Design
	3D Modeling and Animation I	3D Modeling and Animation I

⁵ See also <http://www.aegean.gr/culturaltec/MSc/introgr.htm>

2nd Semester		
Core Courses:	Digitisation of Collections	Multimedia Technologies
	Interactive Computer Design	Interactive Computer Design
	3D Modeling and Animation II	3D Modeling and Animation II
Restricted Electives:	Digital Applications for the Presentation of Exhibits	
	Cultural Heritage Topics	
	Art and Virtual Reality	
	Digital Applications in the Spectacle Industry: Animation	
	Cultural Economics	
	Theory and Practice of art Exhibition Design and Curatorship	
	Cultural Technologies and Interactive Games	

The minimum duration of the course is three semesters (12 months), while the maximum a student can stay in the programme is five semesters. During their third semester of studies, the students complete and defend a thesis. Practical applications and exercises are included in the teaching of almost all courses. They are also complemented by site visits, guest lecturers and seminars on specific subjects, run by specialists in their fields.

2. *M.Sc. Multimedia Systems of Cultural Heritage*

The second post-graduate programme of the Department was developed in 2006, in collaboration with the University of Westminster in London, UK, the Harrow School of Computer Science. The Master of Science programme entitled “M.Sc. Multimedia Systems for Cultural Heritage”⁶ was designed according to the Academic Regulations of both Universities, including the modular framework for Postgraduate courses of the Westminster University and the framework for Higher Education Qualifications in England, Wales and Northern Ireland published by the Quality Assurance Agency for Higher Education (QAA), UK. The programme’s duration is one year full-time or two years part-time. Students following this programme study partly at the University of Westminster and partly at the University of the Aegean, since both universities provide modules. The course draws specialized expertise from both Universities to provide students with an understanding of the issues involved in the design and implementation of digital museums and libraries, taking into consideration both technical and conceptual theoretical issues. Cultural

⁶ For further details see http://www.aegean.gr/culturaltec/MSc_MSCH

resources are highly suited to multimedia presentation and this course aims to provide students with the necessary expertise for the development of such systems. The programme seeks to provide an academic, creative and professional experience of both a theoretical and practical nature in the area of museology and interactive multimedia and draws together theory and knowledge from the disciplines of information and computer science, art and graphic design and museum studies. This broad understanding is stimulated by the course's strategy of accepting students from a wide range of archaeology, media, information and computer science disciplines and by organizing the curriculum so that there is a provision for diverse range of experiences, skills and critical debate to expose students to new disciplines as well as to allow them to apply their own expertise in a new medium or discipline. Based on these premises the content of the course is organized around three major themes: interaction design and multimedia systems, heritage computing and digitisation of collections and content management. It attempts to include in its subjects every kind of new data in the field of techno-sciences influencing the transformation mechanisms in the domains of culture and communication. The course will accept its first students in June 2008.

3. MA Cultural Monument Management: Archaeology, Architecture and the City.

Finally, together with the University of Athens, Department of Archaeology and History of Art and the University of Patras, Department of Architecture, the Department of Cultural Technology and Communication has recently organized a new postgraduate course, which has been approved by the Greek Ministry of Education and is going to start in June 2008. It will offer a Master of Arts in "Cultural Monument Management: Archaeology, Architecture and the City". The three departments will join their expertise and offer courses in their respective fields to promote interdisciplinary research and educate students in new areas of specialisation.

The MA programme aims to pursue interdisciplinary research on the management and promotion of cultural monuments with the use of ICT and architecture, particularly the urban and sub-urban space. The starting point for pursuing such a programme has been the realization that in recent years there have been two main dynamics as far as the development of historically important areas is

concerned: (a) the dynamics of development leading to a quickly and extensively urbanized planet and (b) the dynamics of historical continuation and the preservation of cultural heritage that is particularly important in urban centres. Until recently, these two dynamics have been in a constant polemic, each facing the other as the major obstacle in their work. For the archaeologist and the cultural manager the urban and sub-urban development has been a serious danger in their effort to discover, restore and promote cultural monuments. On the contrary, for the current urban planning practice the presence of archaeological or cultural interest in an area has been considered a most disagreeable development since it meant the delay or postponement of modern urban planning. This post-graduate programme is based on the belief that the relation of these two dynamics has been put upon a wrong basis and that these two can co-exist and support each other based upon scientific, ethical and social foundations. The programme is structured around three thematic areas: History and Theory, Methodology and Techniques, and Practical issues. The course also includes two “Projects”, in which students undertake a real project that combines preservation of built heritage and urban planning. These projects will take place in various parts of Greece, i.e. Naxos, Mytilene, Athens, Patras and so on, in places where historical past and urban development co-exist.

Most teaching of the programme will take place in Athens, while the Universities of Patras and of the Aegean will provide their teaching taking advantage of new technologies, i.e. using e-learning as a major teaching tool and “experimenting” with video-conferencing and the development of other media for distance-learning. All teaching will be in Greek, but students will be expected to be fluent in English and there will be seminars by guest speakers and experts from other countries as well.

4. Other Research Activities of the Department

Apart from the previously described graduate programmes, the academic community of the Department is enriched by the presence of Ph.D. students and post-doctoral researchers, pursuing research in fields related to the department’s research interests, i.e. issues of cultural heritage, humanities and new media.

The Department carries out a series of research programmes related to the main thematic areas and disciplines it pursues. Thus, it contributes to the recording, analysis and promotion of aspects and practices of the Greek, European and international culture, through the qualified production and administration of cultural services and products. In order to administer more effectively all its research activities, the department has founded seven research laboratories:

- Picture, sound and cultural representation
- Youth and media
- Museology
- Cultural informatics
- Virtual reality
- Cultural heritage management
- Distance and e-learning

Each research laboratory undertakes national and international research projects (which in the seven years of the department's life exceed 35, according to a recent report), organize conferences and events, and publish research reports and/or journals.⁷

The DCTC of the University of the Aegean works hard to keep up to date with the dynamic developments in digital technologies and the challenges they introduce for the humanities and the social sciences. It is particularly interested in museums and their role in the new digital world; we all hope that we will be able to contribute to the creation of interesting new possibilities and roles for heritage and its future.

⁷ A brief presentation of the programmes is available at <http://www.aegean.gr/culturaltec/eprogrammata.htm>

New Technologies in cultural heritage: Overview of the educational situation in Greek universities

Undergraduate curricula

According to a recent EPOCH survey, Greece is among the countries that have adopted a very dynamic approach towards the combination of new technologies with cultural heritage.⁸ The use of ICT is present is almost all levels of higher education, from undergraduate to postgraduate. However, apart from a few pioneering and dynamic efforts in the area, in general, the integration of ICT in the subjects related to cultural heritage is still limited. The academic curricula of most humanities disciplines in Greece (such as archaeology, history, history of art) have hesitantly introduced some ICT courses, but these remain peripheral to the core teaching. A further problem is that in general, access to the Internet and ICT provision to undergraduates remains poor at most humanities departments in Greece, while general ICT penetration in Greek society is one of the lowest (though, constantly increasing) in the EU.⁹ At the same time, courses on cultural heritage and its management and different aspects of museology are slowly being introduced at undergraduate level, but are still limited.

Some examples of related courses offered at older departments in Greek universities include:

Indicative examples of ICT courses introduced to Greek undergraduate curricula – Older universities		
University	‘Traditional’ Arts & Humanities Departments	ICT courses in the Curriculum
Ionian University, Corfu	History Department	1st year seminar, “Informatics: Quantitative methods”
University of Thessaly, Volos	Dept of History, Archaeology and Social Anthropology	Optional Seminar “Working practices in the digital environment”
Fine Arts Department,		optional theoretical course at 2nd year “History of New Media”, lab “Multimedia/hypermedia”

⁸ Nicolucci, 2006 , Epoch Report on Training Offerings and Needs in Europe on ICT Applications to Cultural Heritage

⁹ Eurostat DATA in focus. 2007. *Internet usage in 2007. Households and Individuals.*

http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-07-023/EN/KS-QA-07-023-EN.PDF (last visited 14/2/08). European Commission. 2007. *E-Communication Household Survey*, special Eurobarometer 274. (survey Nov-Dec 2006) http://ec.europa.eu/public_opinion/archives/ebs/ebs_276_en.pdf (last visited 14/2/08)

Athens		
Ionian University, Corfu	Dept of Archival and Library Studies	1st year course “Introduction to Information Science”, 2nd year “Databases”, 3d year “Human-Computer Interaction” “Information Systems”, 4th year “Info Retrieval”
Panteion University, Athens	Dept of Communication, Media and Culture	One of 3 divisions: culture & cultural management: 3d & 4 th yr courses: “Culture, media, & civilisation”, “Computer applications lab”, “Political economy of the Internet”, “Strategical issues of cultura heritage management”, “Digital collections & cultural multimedia”

Academic departments which were created after 2000 were more open to introducing related courses in their curricula, as you can see from the examples below.

Some examples of ICT courses introduced to Greek undergraduate curricula – Newer Universities or Departments		
University	Department	ICT courses in the curriculum
University of Peloponnese, Kalamata	Dept of History, Archaeology and Management of Cultural Resources (2003)	2nd yr “Cultural Management: Preservation of Cultural Objects and Environment”, 3d yr Seminar “Promotion of Cultural Heritage using New Technologies”, 4th yr option “Electronic documentation-Digital photography of archaeological objects”
Ionian University, Corfu	Dept of the Arts of Sound and Image (2003)	1st yr “Introduction to Digital Technology” and “Multimedia in Information Society”, 2nd yr “Digital Visual Arts”, “Interactive Multimedia”, 3d yr “Experimental Multimedia”, “HCI”, “Psychology and semiology of multimedia”, “History of digital art”, 4th yr “Pedagogy of new media”, “Computer Art – Web Art”, “Management of cultural products & legal aspects”, “Virtual and augmented reality”

At the same time some of the newer departments which were created after the millennium, took up the challenges of the digital world and how these reflect in the shaping of cultural heritage in the design of their curricula. One of these early pioneers was the Department of Cultural Technology and Communication, whose undergraduate and postgraduate teaching has been described above.

Cultural Heritage Computing at Greek undergraduate curricula – Specialised Departments		
University	Department	ICT courses

University of the Aegean	Dept of Cultural Technology and Communication (2000) (new name “Cultural Informatics”), Mytilene	Details of courses described in the relevant section above
University of Ioannina	Dept of Management of Cultural Environment & New Technologies (2004), Ioannina	<ul style="list-style-type: none"> ● humanities & arts courses (e.g. “History of European Art”, “Ancient History”) ● IT courses (e.g. “Object-oriented programming”, “Computer networks”, “Multimedia Applications”) ● Cultural management & cult. computing (e.g. 3d yr “Introduction to the management and of digital cultural products”, 4th yr “Digital Libraries”, “Methodology of production of cultural & multimedia titles”, “Cultural preservation and promotion of cultural products”)

Postgraduate curricula

In January 2007 an Internet platform called “e-learning”¹⁰ prepared by the Technological Educational Institute of Serres (TEI), Greece, listed the post-graduate programmes offered by Greek Universities. According to this listing, the eighteen (18) Universities of Greece (excluding the Technological Educational Institutes¹¹) offer an overall of 343 post-graduate programmes on all disciplines. This number does not include the divisions of each programme, but it does include inter-university and inter-departmental post-graduate curricula.

Almost all departments offer post-graduate courses on the main disciplinary areas they belong to, whereas there are certain examples where interdisciplinary curricula have been developed. All departments of Information Technology and Computer Sciences as well as all departments of Humanities organize courses on the main fields of their disciplines. Some IT departments, in collaboration with other universities or other departments organize programmes addressing mainly the use of informatics in education. For example, the University of Piraeus, Technology Education and Digital Systems, offers post-graduate programmes on e-learning and digital communication and networks. Alternatively, there are departments, which focus on the use of ICT for education in terms of their specific disciplinary interests. For instance, the Department of Philosophy, Pedagogy

¹⁰ <http://elearning.teiser.gr/index.php?lang=el>

¹¹ The Technological Educational Institutes’ status is closer to what used to be the English Polytechnics; they do not have the right to offer postgraduate courses unless they co-operate with one of the Universities.

and Psychology of the University of Athens offers a postgraduate programme on Contemporary Technologies in Education, the Biology Department of the same university offers a course on “New Technologies in Teaching Biological Curricula”, whereas the Department of French Language and Literature in collaboration with the Departments of German and Italian Languages and Literatures and the Department of Electric Engineering offer an inter-departmental course on “Applications of Technology in Language and Communication”.

Interestingly, though, there are very few post-graduate programmes combining ICT technologies with cultural heritage issues in particular. We managed to identify seven programmes that offer partly (meaning specific subjects) or fully Intelligent Heritage courses. Apart from the three of the University of the Aegean that we have already mentioned in detail, we also identified the following four.

The first attempt for collaboration between the two fields was made by the University of Crete in 1998. The Department of History & Archaeology and the Department of Computer Science of the University together with the Institute of Mediterranean Studies and the Institute of Information Science both of the Foundation of Research and Technology offered a joint postgraduate program entitled “Advanced Methods and Information Systems in Archaeology: Research and Management of the Material Remains of Aegean Cultures”, leading to a M.Sc. in “Systems of Cultural Information and Management of Cultural Resources”. The course acquired an excellent reputation by both archaeologists and computer scientists, but was only taught during 1998-99 and 2002-03 and is not available anymore.

The Panteion University in Athens, offers a MA degree on Cultural Policy, Management and Communication. As part of this degree there is one subject entitled “Cultural Communication and New Technologies”. Similarly, the inter-university, inter-departmental postgraduate course on Museum Studies of the University of Athens (Depts of History/Archaeology and Geology of the University of Athens and the Dept. of Conservation of Works of Art of the Technological

Educational Institute of Athens), offers “Computers, New Technologies and Museums” as part of its curriculum.

Finally, the University of West Macedonia, in Florina, offers a postgraduate course within the Department of Pre-School Education, entitled “Cultural Studies (Language, literature, artistic expression) and New Technologies”. Although this could be included in the previously mentioned courses on new technologies and education, the notion of “cultural studies” which seems to be the unifying force for the course gives it a wider perspective.

Taking into account the fact that all the above have been developed during the last 9 years, and the fact that new departments have been recently created to offer courses at an undergraduate level, as we mentioned above, it seems that the Greek academic interests move rapidly towards the combination of new media and traditional disciplines and that the courses on Intelligent Heritage will soon be multiplied.

University	Department	Course	Title	Subjects in Curriculum
Panteion	Department of Communication and Mass Media	MA	Cultural Policy, Management and Communication	Offers course in “Cultural Communication and New Technologies”
of the Aegean	Department of Cultural Technology & Communication	MSc	Cultural Informatics	It offers two divisions: Museology and Design and Production of Digital Cultural Products
	Dpt. Of Cultural Technology & Communication and University of Westminster, Harrow School of Computers	MSc	Multimedia Systems for Cultural Heritage	Course is approved and will start in August 2008
of the Aegean, of Patras & of Athens	Dpt. Of Cultural Technology & Communication & Department of Architecture & Depart. Of History and Archaeology, respectively	MA	Cultural Administration: Archaeology, Architecture and the City	1/3 of the curriculum includes ICT; in combination with history, archaeology and architecture
of Athens	Dept. of Archaeology, Dept.of Geology and Dept. of Conservation of Works of Art, TEI ATHENS	MA	Museology	Offer a course on “Computers, New Technologies and Museums”
of Crete	Department of History & Archaeology and the Department of Computer	MSc	Advanced Methods and Information Systems in Archaeology: Research	Started in 1998 Programme leading to a "Systems of Cultural Information and

	Science The Institute of Mediterranean Studies and the Institute of Information Science of the Foundation of Research and Technology		and Management of the Material Remains of Aegean Cultures	Management of Cultural Resources"
of West Macedonia	Dept. of pre-school education at Florina	MA	Cultural Studies (Language, literature, artistic expression) and New Technologies	Although not humanities in the strict sense of the word, it does indeed offer educational programs in this broader area.

Problems and Concerns

As can be expected, the introduction of new curricula in Greece has not without problems and special concerns, as was the case elsewhere in Europe. We can divide them in two broad categories: those deriving because of deeply founded preconceptions and those deriving from practical and financial reasons.

Finding the right balance between theory and practice, humanities and computer studies has not been easy. The more interdisciplinary and diverse the students' group is, the more difficult it becomes to create an academic platform upon which to built research and new knowledge. In the case of our postgraduate courses, students coming from humanities backgrounds, for instance archaeology or cultural anthropology, usually feel less confident to study their more technical subjects and expect a slower pace in the acquisition of new technical knowledge than the students who come from an informatics background (despite the fact that all students with a humanities background have to pass a competitive examination in computers, among other entry requirement, for getting into the postgraduate programme in the first place). On the contrary, as expected, the latter group of ICT-able students does not feel comfortable at all with issues of theory, such as content analysis, communication models, educational approaches and so on. It is up to the experience of the teaching faculty to find the right pace for the group, to bring it in balance, to encourage them to gain from each other's experience, to persuade the group members not to be afraid of the new knowledge and to motive them all towards a common goal.

In addition, alternative teaching methods often receive suspicion and negative attitude. For instance, e-learning teaching methods are often met with resistance and suspicion because of personal insecurities in terms of the use of new media.

On the other hand, the financial implications of running undergraduate and postgraduate programmes which combine new technologies with cultural heritage studies have to be seriously taken into account. The cost for equipment, their upgrade, software licenses and so on, increases the cost of running such a programme and creates difficulties especially to the poorly financed humanities departments. The lack of experienced staff specialized on the interdisciplinary area of cultural informatics, which also relates to the priorities for hiring of previous years and generations, adds to the above problems. Similarly, informatics departments tend to be less concerned about content that they should be, or they concentrate on technological development more than on the use of it. Sometimes, it is just the lack of a common language that will allow humanities and ICT people to communicate and share their concerns. This adds to the existing reluctance and perpetuates the distance.

Suggestions: how can an inter-disciplinary programme be constructed

Combining particular aspects of different disciplines to develop entirely new ways to approach humanities and information technology research problems is daunting in many ways. Nevertheless, experience over the last seven years has persuaded us that it is an effort worth undertaking. We believe that it is important to try to strike the right balance between technology and culture and also between theory and practice and aim into creating a real synthesis.

An academic programme (whether at undergraduate or postgraduate level) aiming to combine humanities and new media should aim at very clearly defined aims, right from the beginning. It should aim to provide an academic and professional experience in both the sciences and technologies that underpin information and communication studies as well as cultural studies, including archaeology, history, cultural anthropology, art, museology, tourism and so on.

Furthermore, it should aim to produce graduates possessing awareness, knowledge and practical skills in the field it aims to cover and enabling them to follow a programme of study that will offer them relevant specialization and career options. We believe that in this direction it is more important to focus on methodologies and ways of thinking and approaching a problem, rather than on teaching the use of specific ICT tools. In the same direction, it is important to incorporate real case studies and encourage their critical analysis in the programme of studies. In addition, an interdisciplinary programme should aim to develop the students' professional attitude, interpersonal and entrepreneurial skills, required by the contemporary job market, which is why we believe that offering opportunities for work experience and practical training are important in the design of similar curricula. Finally, it should produce experts with critical and evaluative perspectives related to both the technologies and the humanities, while developing their capacity for independent and self-reflective learning, ensuring their future contribution to research and development. We have seen all too often new technological tools being used to convey old messages in traditional approaches and we think that it is important for academic programmes in this developing field to encourage new ways of thinking and novel approaches.

Inter-departmental, inter-university and international co-operations are important in order to achieve a high standard of education in the contemporary world. We believe that the academic programmes developed at the University of the Aegean lead the way towards new perspectives in Heritage Interpretation with the use of new media and we are looking forward for new developments and new perspectives in this field.

A PROPOSAL FOR A CURRICULUM IN DIGITAL APPROACHES TO CULTURAL HERITAGE

Sorin Hermon

Vast-Lab, PIN, University of Florence, Italy,

Email: sorin.hermon@pin.unifi.it

keywords

individual knowledge, multi – disciplinary approach, inter – departmental center, selective knowledge, communities of practice, digital knowledge technologies, transfer of learning, educational psychology, learning by engagement.

The draft curriculum presented below is based on ideas taken from educational psychology approaches related to the use of new media and new (IST) tools, and in particular the application of IST as digital cognitive tools, having in mind two main objectives: engaging IST for the creation of knowledge by learners and the use of IST for the creation of social spaces of learning, merging concepts deriving from the constructivist learning theories with the emergence of new technologies and their (potential) impact on society in general and on the learning processes in particular. As such, the curriculum proposed should reflect a balance between the learning of existing IST tools, the creation of new ones, adapted for CH, finding new answers to old questions, the definition of new research questions while implementing IST tools and, in very general terms, using IST in a modern knowledge – based society as a learning instrument of Cultural Heritage.

Following is a proposed syllabus, at BA, MA and PhD levels of courses in CDH. The modules are grouped by the main arguments that complete the research pipeline in humanities and social sciences. This curriculum finally aims at defining a new discipline - Digital Approaches to Cultural Heritage Studies.

Figure 1 summarizes the distribution of modules across semesters and academic degrees; figure 2 offers a potential distribution of attendees across various departments, while figure 3 presents in details the inclusion of different modules into various degree programs.

SYLLABUS FOR COURSES IN DIGITAL HUMANITIES

1. Introduction, theory, methodology and history of research

a. History of research

- i. history of computing
- ii. logics and mathematics
- iii. how computers work
- iv. digital humanities – state-of-the-art and successful stories

b. Knowledge representation

- i. classification systems and methods
- ii. types of knowledge and epistemology
- iii. philosophy of language and communication
- iv. logic and aesthetics

c. Research methods

- i. project design and performance characteristics of digital tools
- ii. text analysis
- iii. data capture, storage and processing
- iv. electronic publication

d. New trends in Digital Humanities

- i. fuzzy logic, chaos theory and expert systems
- ii. agent based modeling and empirical modeling
- iii. artificial intelligence
- iv. natural language processing
- v. time, temporal relations and predictive modeling

e. Impact of ICT

- i. shift from work to text and back
- ii. form and expression
- iii. social and economic impact
- iv. information sharing and information overflow

2. Data Acquisition

a. Text analysis

- i. Digitization and OCR
- ii. Mark-up (JITM, COCOA)
- iii. DTD

SYLLABUS FOR COURSES IN DIGITAL HUMANITIES

- b. Online data harvesting
 - i. Internet search and evaluate
 - ii. Query building
 - iii. Knowledge recovery
 - iv. Resource selection strategies
 - v. Data mining (NORA, D2K, T2K)
- c. Remote sensing and image processing
 - i. Image acquisition (3D scanner and photogrammetry)
 - ii. Video mosaicing
 - iii. Satellite and aerial photos
 - iv. Remote sensing
 - v. Nomadic technologies (total station, PDA, etc.)
 - vi. CAD systems

3. Knowledge Management

- a. Text managing
 - i. Encoding and XML
 - ii. Tagging
 - iii. Knowledge compilation
 - iv. Automatic planning
- b. Standards
 - i. Building ontology
 - ii. Thesauri definition
 - iii. CIDOC and other standards
 - iv. Data and metadata
 - v. Mapping data formats
 - vi. Indexing
- c. Building databases
 - i. databases types (OO, relational, reference collection, training, on-line)
 - ii. Storing multi media
 - iii. Spatial data management
 - iv. Non-structured data
 - v. Building queries

4. Data Interpretation

SYLLABUS FOR COURSES IN DIGITAL HUMANITIES

- a. Text interpretation
 - i. Interactive concordance
 - ii. Digital annotation
 - b. Visualization and Image processing
 - i. Pattern recognition
 - ii. Video analysis
 - iii. Graphic representation and investigation
 - c. Data investigation
 - i. Virtual reality and 3D modelling
 - ii. Predictive modelling
 - iii. Expert systems and simulations
 - iv. Temporal and spatial GIS
 - v. Landscape and environment reconstruction
 - vi. Spatial analysis
5. Communication of results
- a. Collaborative tools
 - i. New forms of collaboration (3D, wiki, online resources)
 - ii. Creation of dictionaries and translation tools
 - iii. Creation of domain knowledge
 - iv. Grid technologies
 - b. Knowledge representation
 - i. Multi media applications
 - ii. Interfaces and Human – computer interaction
 - iii. Augmented reality, haptic devices
 - iv. ICT in museum environments
 - v. Game design
 - c. Internet technologies
 - i. HTML, JAVA etc.
 - d. Managing online collections
 - i. eXist and XML
 - ii. MSQL

SYLLABUS FOR COURSES IN DIGITAL HUMANITIES

- iii. CSS
- e. Electronic publishing
 - i. Web authoring
 - ii. Photoshop, Dreamweaver, and ImageReady
 - iii. Flash, other web design software
 - iv. eBooks

DRAFT PROPOSAL FOR A SYLLABUS OF COURSES IN DIGITAL HUMANITIES							
Course Title	No	Module Name	BA		MA		PhD
			II fall	III spring	I fall	II spring	
1 Introduction, theory, methodology and history of research	a	History of research	[Orange]				
	b	Knowledge representation		[Yellow]			[Yellow]
	c	Research methods		[Orange]			[Orange]
	d	New trends		[Orange]			
	e	Impact of ICT			[Brown]		
2 Data Acquisition	a	Text analysis	[Green]				
	b	Online data harvesting		[Green]			
	c	Remote sensing		[Green]			
3 Knowledge Management	a	Text managing		[Light Blue]			
	b	Standards		[Light Blue]			[Light Blue]
	c	Building databases		[Light Blue]			
4 Data Interpretation	a	Text interpretation			[Purple]		
	b	Visualization and Image			[Purple]		
	c	Data investigation				[Purple]	
5 Communication of results	a	Collaborative tools			[Dark Green]		
	b	Knowledge representation					[Dark Blue]
	c	Internet technologies				[Dark Blue]	
	d	Managing online					[Dark Green]
	e	Electronic publishing					[Black]

Figure 1. Main courses and modules

WHO SHOULD ATTEND							
Module No.	Anthropology Archaeology	Geography	History and Art History	Knowledge Management	Literature	Museology	New Media, Communication and Design
1a	x	x	x	x	x	x	x
1b	x	x	x	x	x	x	x
1c	x	x	x	x	x	x	x
1d	x	x	x		x		

SYLLABUS FOR COURSES IN DIGITAL HUMANITIES

1e	x		x		x		x
2a			x				x
2b	x	x	x	x	x	x	x
2c	x	x					
3a			x	x	x	x	
3b	x	x	x	x	x	x	x
3c	x	x	x	x	x	x	x
4a	x		x			x	
4b		x	x				
4c	x	x	x				
5a				x			x
5b	x	x	x			x	x
5c				x	x	x	x
5d				x		x	x
6e				x		x	x

Figure 2. Possible attendees by departments

course	1				2			3			4				5				total credits	
	a	b	c	d	e	a	b	c	a	b	c	a	b	c	a	b	c	d		e
credits	6	4	2	4	2	2	4	6	4	2	6	2	4	6	4	6	2	2	4	
B.A. major	[Orange blocks]																			72
B.A. two depts.	[Orange blocks]																			50
B.A. minor 1	[Yellow blocks]																			28
B.A. minor 2	[Yellow blocks]																			28
B.A. minor 3	[Yellow blocks]																			28
M.A. CH - tangible	[Dark Blue blocks]																			22
M.A. CH - intangible	[Teal blocks]																			22
M.A. communication	[Cyan blocks]																			22
M.A. knowledge management	[Light Blue blocks]																			22
Ph.D.	[Purple blocks]																			4
Ph.D.	[Purple blocks]																			4
Ph.D.	[Purple blocks]																			2
Ph.D.	[Purple blocks]																			4
Ph.D.	[Purple blocks]																			4
Ph.D.	[Purple blocks]																			6
Ph.D.	[Purple blocks]																			6
Ph.D.	[Purple blocks]																			4
Ph.D.	[Purple blocks]																			6
Ph.D.	[Purple blocks]																			6

Figure 3. Distribution of courses by academic programs