Virtual Cultural Heritage Metadata

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Abstract: *Today, the need for Cultural Heritage Management (CHM) is emphasized in the international policy arena. In this domain, new technology (ICT) and digital media have the competence to become a tool for capturing both the tangible and the intangible essence of the cultural heritage. In this paper, firstly, Web-based online learning environments for CHM and relative metadata systems are critically discussed; and secondly, an integrated metadata system for the management of cultural heritage is proposed, whilst emphasis is laying on the consideration of social context and its connection with ICT issues. Finally, a Web-based online learning system (Virtual Cultural Heritage Learning), which is under implementation at the Landscape Architecture Department / Kavala Institute of Technology (Greece) is presented as an application case study.*

Keywords: *Community Cultural Heritage Systems, Metadata, Virtual Heritage, Web-based online applications.*

1. Introduction

1.1 The importance of metadata systems in the political agenda

Metadata is the cornerstone of eLearning, and this has been a major initiative of many national and international institutions as it has been recognized as a tool for overcoming geographical and socio-economic obstacles (cf. Spaniol et al. 2007 [20], Renzel et al. 2008 [17], Kumar et al. 2002 [15]). In the past, knowledge and books were products accessible only to “elites” like few professors, researchers, rich cosmopolites who could travel abroad. Now, internet has made knowledge accessible to all people, even to not highly educated ones.

The EU Commissioner for Education, Training, Culture and Multilingualism, Jan Figel, has emphasized that the globalization, new technologies and demographic developments constitute an enormous challenge and one of the answers to this problem is the access to lifelong learning. Simultaneously, “digital culture” has been an officially established term by EU (Council Resolution of 13 July 2001 on eLearning [3]).

The European Commission seeks to mobilize the educational and cultural communities, as well as the economic and social players in Europe, in order to accelerate changes in the education and training systems for Europe's move to a “knowledge-based” society. Particularly, at the Lisbon European Council on 23 and 24 March 2000, the Heads of State and Government set the Union the objective of becoming “the most competitive and dynamic knowledge-driven economy in the world” (European Commission: Education and Training, 2009 [5]).

This initiative is composed of four components: a) to equip schools with multimedia computers, b) to train European teachers in digital technologies, c) to develop European educational services and software and d) to speed up the networking of schools and teachers. Most of the resources to be mobilized will be national, but they should be backed by all the adequate Community instruments (the education, training and youth programmes for

innovative actions and exchange of good practice, the Structural Funds for assistance in the eligible regions, the IST to support research and to promote European digital contents) and by the development of partnerships between public authorities and industry.

The following goals are provided in the Council Resolution of 13 July 2001 on eLearning [3]:

> “to support the testing of *new learning environments* and approaches in order to take into account the growing *differentiation of learners' styles*, cultures and languages, and to foster, in cooperation with Member States, virtual mobility and *transnational* virtual campus projects, especially in the field of languages, science and technology, art and culture;”
>
> and
>
> “to undertake strategic studies on innovative approaches in education, on the *pedagogical* aspects of new technologies, on the strengths and weaknesses of the European *educational* multimedia sector, and on the potential of *cultural* institutions and science centres as new learning environments;”

Such a digital culture and infrastructure do not apply only to teachers and schools but also to a wide range of communities of practice which can be networked through this digital infrastructure and become more active “web communities” (Cao 2008a [1]). Wenger (1998) [22] defined such communities as groups of people who share a *concern* or a *passion* for something they do, and who interact regularly to learn how to do it better.

Although digital media are usually employed in virtual re-constructions of built entities and landscapes or in depicting spatial relations and design ideas, they can present a much wider range of applications (cf. Cao 2008b [2]). They can become a tool for capturing both tangible and intangible aspects and values of the cultural heritage as well as of the community which has created or is expected to use this heritage. ICT is used in *saving data (recording)*, *modeling*, *visualize*, *learn* and *communicate* cultural, environmental and human heritage knowledge and it is known as “Virtual Heritage”, “Digital Cultural Heritage”, or “New Heritage”; an exciting topic in academia and research.

In this paper a novel metadata structure for sharing knowledge and preserving technical statutory, learning functionality, communication and rich media digital cultural heritage content is presented and discussed. Also, its functionality is projected to the so-called community cultural heritage systems (CCHS) and possible enquires of the type: *what, why, how, whom, when* and *where* are supported.

1.2 Reviewing metadata systems

Metadata is a conceptual “cornerstone” of this procedure as they are data which defines or describes other data and are characterized by specific scope, authority, semantic, syntactic and lexical rule (ISO JTC 1 IEC Information Technology Standards, http://metadata-standards.org, 2009 [7]). However, this ICT nomenclature should also be combined with the social context in order to find application in heritage issues. ISO JTC definitions are only useful for setting a wide framework as they are quite idealized and abstract. They do not provide any pattern directly applicable to concrete research issues.

Goddard Space Flight Center (http://gcmd.NASA.gov/Records/Metavist.html, 2009 [6]) suggests a more concise list of metadata: Identification Information, Data Quality

Information, Spatial Data Organization Information, Spatial Reference Information, Entity and Attribute Information, Distribution Information and Metadata Reference Information. These metadata categories strongly focus on issues of accuracy, usability (cf. Sharon and Douglas 2004 [19]) and security, concerning spatial, technical and in part organizational aspects, but not social contexts.

The Dublin Core Metadata Initiative (http://www.dublincore.org [4], Weibel et al. 1998 [21]) has formulated metadata that can be categorized as follows: a) *administrative* (e.g. creator, publisher, contributor, rights), b) *descriptive* (coverage, title, subject, description, type, source, relation), and c) *technical* metadata (like date, identifier, language). These are ideal for Architecture and 3D Modeling (cf. Open GIS Abstract Specification 2000 [16]). They are also applicable to other subject areas lime Arts & Humanities, Science, Engineering & Technology, Social Sciences, Health & Life Sciences. Nevertheless, these categories should be further operationalized in order to precisely answer enquires like *why* and *how*.

Klamma et al. (2005b) [14] have distinguished web communities in the field of landscape and monument policy as follows: a) *Government and administration sector* such as members of UNESCO, b) *Research sector* such as students and lecturers of different majors, and c) *Preservation sector* such as engineers and scientists in the cultural heritage conservation field. This categorization can be completed by one more group: the *users* of heritage.

The people of the three communities mentioned above can also behave as users during the time they are "out of duty" as well as many other groups like pupils, school teachers, and every other person interested in cultural heritage. Web communities are characterized by diverse interface analyzed in two main dimensions: i) generation and ii) expertise (Jarke and Klamma 2008 [9], Jarke et al. 2008 [10], Jaeger et al. 2008 [8]).

Digital communication should be designed both for intra- and intergenerational as well as for intra- and interdisciplinary learning environment (Table 1). It is a reasonable hypothesis that intra-generational communication is simpler, while inter-generational communication often needs to be supported by interpretation and *empathy* in order to be effective (new generations do not interpret a 2nd World War monument in the same way as the older generation). Intra-disciplinary communication is also different from the interdisciplinary interplay.

Table 1. *Learning environments of digital communication system*.

		Expertise	
		Intra-disciplinary	Inter-disciplinary
Generation	Intra-generational	*Simplicity*	*Metadata abstraction*
	Inter-generational	*Empathy*	*Empathy/ metadata abstraction*

The intra-disciplinary communication is supposed to be based on common terminology, methods and theories which are familiar to all experts. Inter-disciplinary approach is characterized by many obstacles like differences in terminology, theories and methods (as well as by sectional and personal interests and power game). At least the obstacles related to terminology, theories and methodology can be in part solved by *abstraction* of metadata (and if this is functional and practice-relevant enough, it may even contribute to the resolution of interest-related obstacles).

2. Conceiving an Integrated Metadata Management System

Cultural heritage, as a complex and highly interdisciplinary area needs the definition of metadata structures (like Core, CIDOC) that can be easily added to all works and documents. Also, new ICT-based metadata are needed for digital cultural heritage online portals (Web-sites), digital representations, e-learning and communication. Obviously, for a new cultural heritage interpretation, the classical "standards" or "metadata standards" have their limitations. In general, heritage-related metadata should be transferable at both interdisciplinary and intergenerational level.

Klamma et al. (2005a and 2005b) have outlined a four-part system for managing metadata regarding cultural heritage: a) GIS: spatial database (Geo-objects) (Klamma and Jarke 2008 [12]), b) Multimedia database (image, video etc), c) Cultural heritage XML (fieldwork, snapshot, document, human-made items), d) Community (users and non-users of heritage). Each *Object* (geo-object and items) could be presented by many *Media*. Media comes from fieldwork, snapshots or documents (*Source*). This is the clearest relation in the system. Other entities are aggregated with the three main entities. For instance, the *Person* entity builds up the community (*User* and *Non-user)* is the provider of *Source*. Users may have "*Behavior* tracing" and their own "*Collection* to collect *media"*.

This is a useful model for a general understanding of heritage-related system but not for deepening in social metadata. A reconstructed system is suggested in Fig. 1.

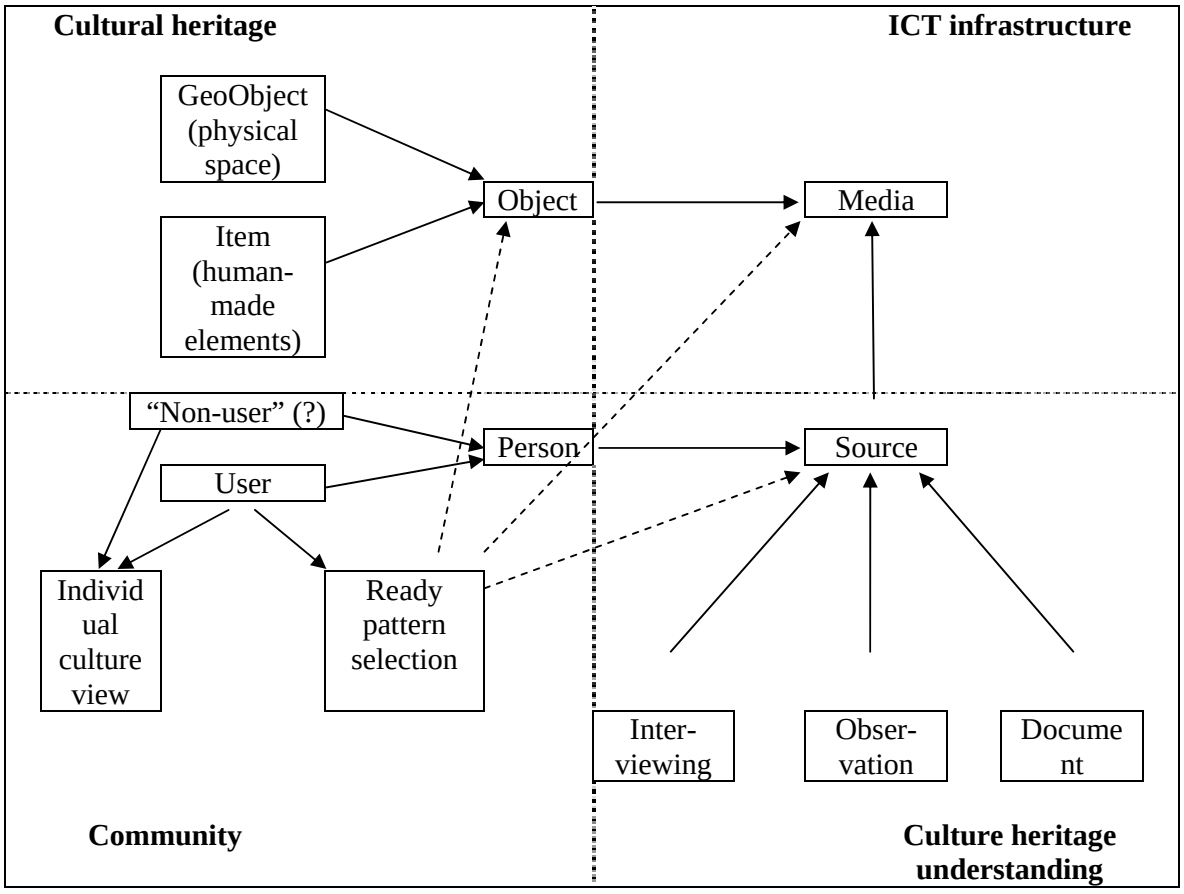

Fig. 1. *Main entity relationship diagram [modified Klamma et al. (2005a) model]*.

For the understanding and further development of social metadata with strong explanatory value, it is important to examine whether a user mostly constructs "culture" by adopting ready patterns of objects, media and sources provided by the policy-makers, heritage managers or digital designers, or he prefers to maintain his own individual view of culture. One should not forget that cultural heritage is always constructed. It is just a selected "clip" of the reality (or a chain of "clips").

These "clips" are seamed either by a user himself or by heritage managers, digital designers and policy-makers. Some may regard as "user" only him who uses the provided patterns. However, heritage "user" can also be an individualist. "Non-user", as it is normally meant, means actually "non-user of patterns" and not "non-user of heritage". For this reason, it is disputable whether it makes sense to talk about "non-users" or to make any distinction between "users" and "non-users". Everyone lives in the reality (which inevitably is based on the past), he is influenced by this and selects certain "clips". Additionally, even a so-called "non-user" may also provide heritage-related sources, as Klamma et al. (2005a and 200b) accept.

In order to better examine the influence of the sources (fieldwork, snapshots and documents) on the observers as well as their functionality for the digital designers, they should be newly distinguished in a more operational way: a) interviewing (oral information), b) observation (visual information) and c) document (written information).

3. Enquires for Future Research

Considering perceptibility of heritage by the "users" as dependent variable, then both social descriptive metadata as well as technical metadata could reasonably be regarded as independent variables. The following questions may be posed in future research:

Which descriptive or technical metadata influence this option (between individualism or pattern adoption)? Age, education level, status, socializing (cf. Kumar et al. 2002, cf. Wenger 1998), "negativity" of a monument, maintenance, aesthetics, accuracy, digital adjustments etc?

These metadata can make the questions of *whom, when* and *where* more operational and quantifiable, e.g. *what* types of monuments becomes most familiar? Well maintained or abandoned ones? Related with "negative" or "positive" memories? To *whom* are they most familiar and impressive? Old or young "users"? Highly or low-educated? *When* a monument should have been constructed or promoted in order to impress people? *How* should be digitally reconstructed in order to impress specific tourist groups? *Where* are the mostly visited monuments located and *where* do monuments exist at all?

The categorization of sources mentioned above and especially the interviewing are useful for understanding *why* heritage is perceived positively and effectively -or not- by specific groups and according to specific communication patterns (particular objects, projected in specific ways and communication channels) (Table 2).

Table 2. *Source and type of information provided.*

		What	*When*	*Where*	*Whom*	*Why*	*How*
Sourc	Interviewing	X		X		X	X
	Observation			X	X		X
	Documents		X	X			X

The specific groups (*whom*) can be detected by observation and the specific patterns (*how* to communicate) can afterwards be explored by interviewing. The afore-mentioned questions about "*what* types of monuments", "*when* to be constructed or promoted" can be answered by interviewing and documents. *Where* the highest visit rate appears can be answered by interviewing (e.g. standardized questionnaires) and observation. Where monuments exist can be discovered by documents (e.g. maps and witnesses).

Observation and interviewing can also help understand to answer the question of visit rate and perceptiveness as well as *how* (and to what extent) a "user" is influenced by a "non-user"? Document analysis can also be illuminative about *how* heritage should digitally be reconstructed.

4. An Application Case Study: Web-based Online CH Management

An application of metadata system is the Web-based Online Learning system (Virtual Cultural Heritage Learning) under development at the Landscape Architecture Department / Kavala Institute of Technology ([11]: http://la.teikav.edu.gr/la, 2009, Figs. 2, 3 and 4).

Sauer (1925) [18] pointed out the *force of culture* in shaping the visible features of the Earth's surface in delimited areas. Within his definition, the physical environment retains a central significance, as the medium with and through which human cultures act. His definition of a "cultural landscape" is the following one: *"The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural are the medium, the cultural landscape is the result".*

The "force of culture" mentioned above can be analyzed by metadata (technical, political, socio-economic and law factors). Cultural Landscapes have been defined by the World Heritage Committee as distinct geographical areas uniquely "... represent[ing] the combined work of nature and of man...". This concept is in accordance with the concepts of other international institutions like the EU (European Landscape Convention).

The World Heritage Committee suggests three categories of cultural landscape: 1. "a landscape designed and created intentionally by man", 2. an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape", 3. an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element".

In Figs. 2 and 3, a landscape of the category (iii) has been depicted. In Fig. 2, extensively visualized descriptive metadata (planting material and built environment) are presented.

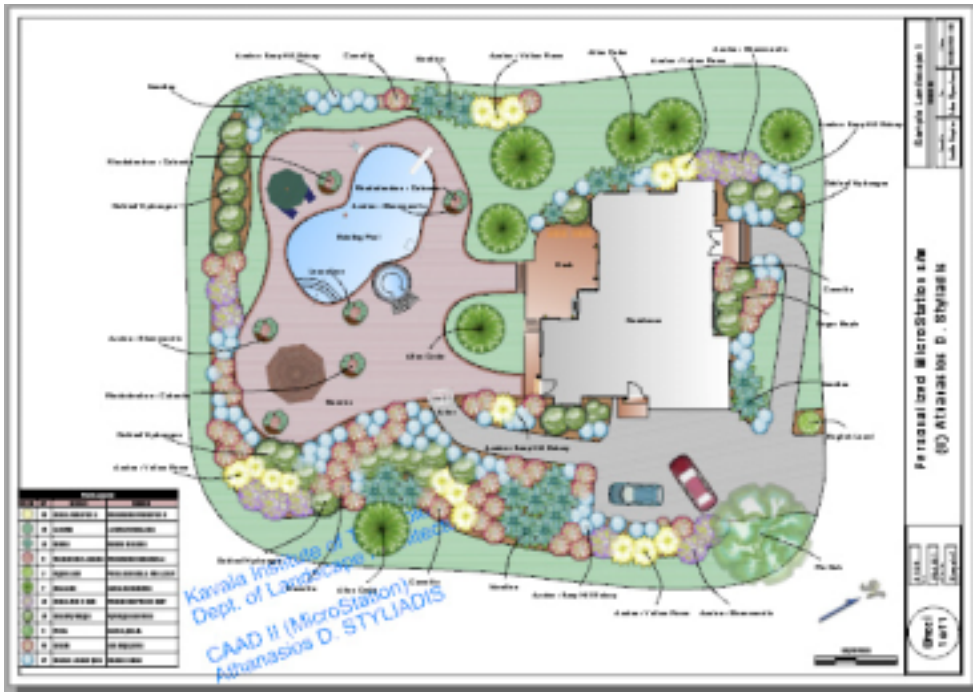

Fig. 2. *Cultural landscape with visualized metadata.*

In Fig. 3, a visual object is presented at smaller scale than in Fig. 2, and it is supported by listed metadata, which may be of descriptive (built, natural environment, use) and administrative (right to access, rules of use) or technical ones (e.g. identifier in GIS system).

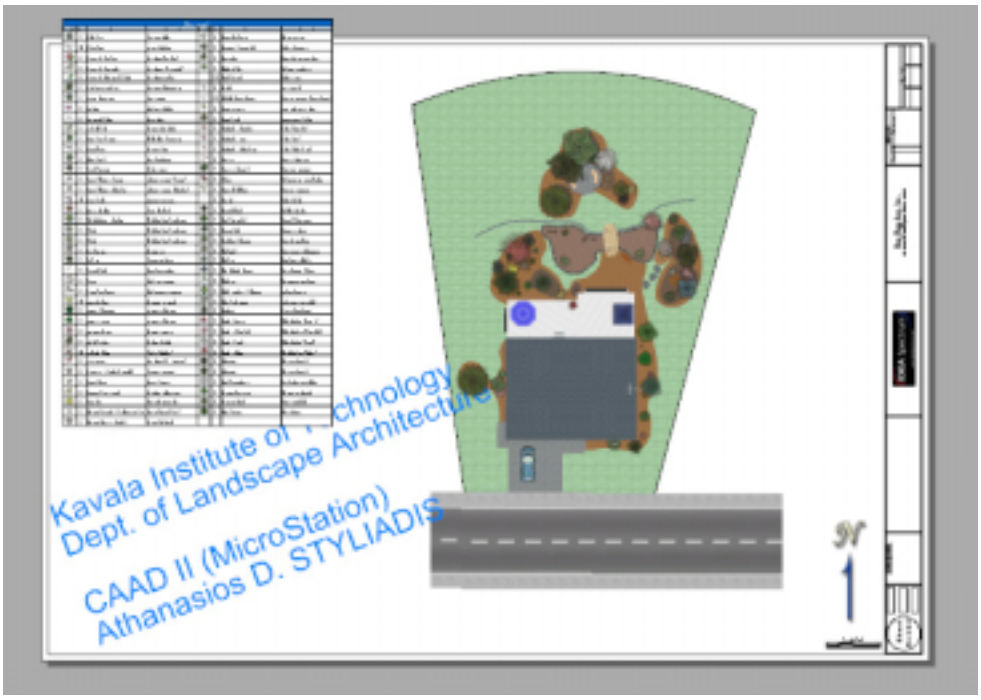

Fig. 3. *Cultural landscape with listed metadata.*

The metadata tags used in this case study are selected from the scientific areas of Cultural Heritage, Computer Modeling (CAAD) and Landscape Architecture. For instance in Fig. 4 the tags: *CAAD*, *e-Learning*, *LA* are used for indexing purposes.

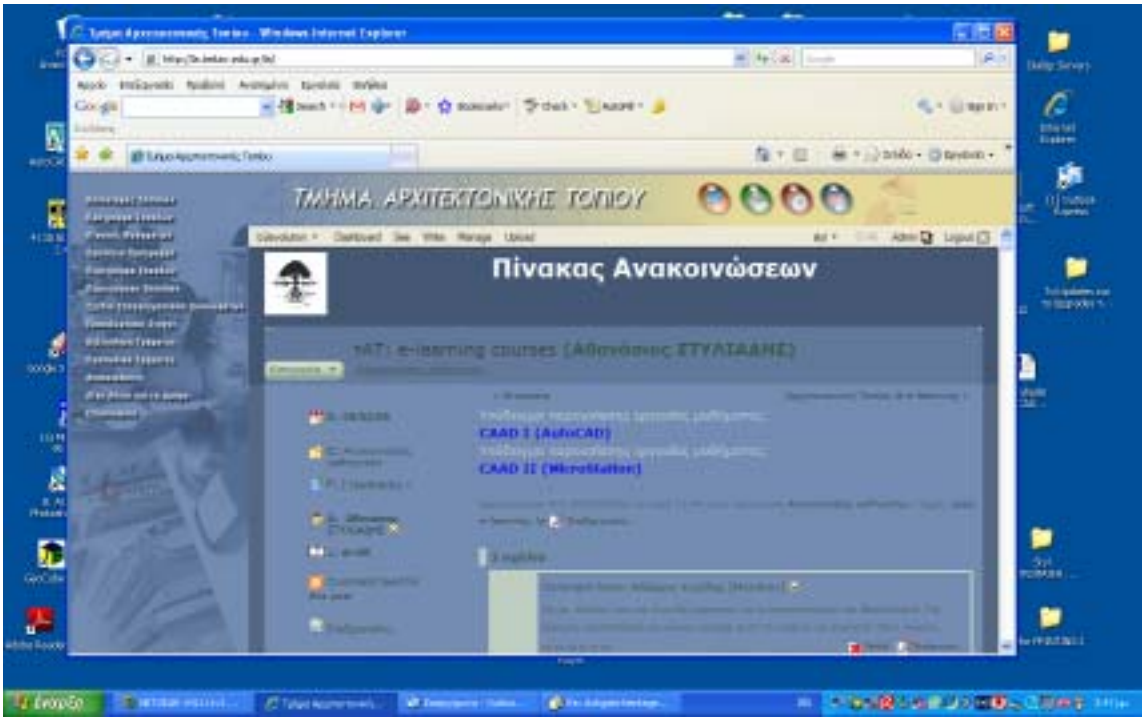

Fig. 4. *Application of CAAD and e-Learning in Landscape Architecture.*

Provided that these metadata are presented in a controlled environment, they can be listed or visualized and processed. The visual objects can also be modified in accordance with metadata, or inversely. They can be useful for *Government and administration sector*, *research sector*, *preservation sector* and the *users* of cultural heritage.

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