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Setting the Framework for Developing eGovernment Services on Cultural Heritage

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SETTING THE FRAMEWORK FOR DEVELOPING E-GOVERNMENT SERVICES ON CULTURAL HERITAGE

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Abstract

This article is aimed at the design of a framework for the development of e-Government services on cultural heritage. Starting from a survey of the websites of the ministries of culture of a group of European Union countries we make a classification of the e-services provided and draw the conclusion that the development of advanced and complex services is possible with today's technology but this technology is only an enabling factor and not a guarantee of success. The Lisbon strategy defined for the European Union aims at both the creation of the technical capability and also and foremost at the provision of content to the public. This goal, in turn, requires the compatibility of generated content across multiple, locally generated sites. Dynamic content exchange requires the use of a prescriptive framework for the development of cultural heritage websites, and their underlying data. This paper provides a primer on the development of such framework using observations from concrete applications, knowledge of information systems development methodologies, and today's field proven IDEF0 modelling method.

Key words: cultural heritage, e-Government, development framework, e-services classification.

1 INTRODUCTION

E-Government has proven to be a durable and popular public management reform option over the last decade, attractive to elected officials and stakeholders who see its political and public benefits (Coursey and Killingsworth 2000). Research on e-Government focuses on the beneficial effects of new technologies and examines the reasons why and how technology adoption occurs (Abramson and Means 2001, Fountain 2001, Moon 2002, Ho 2002). Fountain (2003) argues that ICT can enhance democracy by making public information more accessible and by enabling a range of civic discourses that otherwise would not occur: from facilitating citizen-initiated contacts through the Web (Thomas and Streib 2003), to enabling a representative and meaningful discourse that replaces complicated administration processes (Shi and Scavo 2000). However the potential of e-Government in this area has remained largely unfulfilled (West 2004).

The Lisbon strategy for eEurope (EU Report 2002) is aimed to "make the European Union the most competitive and dynamic knowledge-based economy with improved economy and social cohesion by 2010", which in concrete terms means broadband and high-level internet based services for the entire population of the European Union. The means envisioned to achieve this goal are largely based on increasing both demand and offer of e-services respectively from the public/users and the providers. The problem has been framed as a "chicken and egg" problem and the solution has therefore been to increase government-side services and to create a friendly legislation for the implementation and sale of broadband connections (EU Report 2002). This article focuses on the development of the public electronic services.

On the demand side electronic governmental initiatives involve providing services in eGovernment, eLearning, eHealth, and eBusiness (EU Report 2002). While the efforts of e-Government are focusing on providing services to citizens in order to achieve higher efficiencies through automation (tax filing, certification, electronic voting, information provision etc.) one other important area of investment regards the facilitation of access to cultural resources. The regional and local cultural heritage (to be defined in a broad sense, from museums to regional gastronomy and folklore) is one of Europe's greatest economic assets, and ICT and other advanced technologies can dramatically increase the possibility of its exploitation. Until now the governmental initiatives for the divulgation of electronic material on the local cultural heritage have been varied in nature and include the creation of portals for information on cultural events (ref. Ministries and Departments of Culture of Italy, Greece, and UK) which is the most common model of exploitation today, the digitalization of artwork (e.g. Government Art Collection in UK), the creation of tri-dimensional museum visits with tri-dimensional digitalization of art works (ref. Aquarelle Project) the rendering of archaeological visits in digital formats (ref. Direzione Generale per i Beni Archeologici - Italy).

The potential of using electronic services for cultural heritage applications is far from being fully exploited and many initiatives have remained at the stage of pilot projects. Of the projects mentioned above none is completed and most contain only one or very few examples of art digitalization. Until now, experiences of use of ICT in cultural heritage sectors too often fail to provide valuable economic results and have generated disappointment among the potential players and beneficiaries. Nevertheless in Europe there are a number of interesting examples and initiatives, on various scales, of successful economic promotion of the cultural heritage (some of these mentioned above). Unfortunately, they have often only a local or regional visibility, and their positive (and negative) experiences cannot be fully exploited and shared by other projects.

In this context, the paper proposes an integrated framework for developing e-Government services on cultural heritage. The framework takes inspiration from the waterfall development methodology – which seems adequate for the particular field of e-services in cultural heritage – and it is based on the activity modelling method IDEF0, where all necessary steps: inputs, outputs, rules, and roles are described in a hierarchical manner.

2 E-SERVICES IN CULTURAL HERITAGE

Before moving on in the presentation of the development framework we would like to present concrete examples e-services provided on cultural heritage. By surveying the web pages of the Ministries of Culture of Greece, Italy, Denmark, France, United Kingdom, Ireland, Spain, and Sweden[1] we have arrived at a classification of e-services in 5 main types: the portal, the archive, the archaeological visit, the virtual-real museum, and the pure-virtual museum. In the following an example for each of these 5 e-services will be briefly explained (where multiple languages were available we chose English references to increase understanding). This section is not intended to show the best examples since a scale has not been developed but to provide an idea of the possibilities explored by the Cultural Ministries of the European countries surveyed.

2.1 The Portal

The portal is the most common expression of governmental activities online (see: *Ministries and Departments of Culture Visited* in the references). Every country surveyed had a website for the ministry of culture that acted as a portal for the activities, electronic and not, of the ministry. These portals provided the point of entry to other initiatives like museums, archaeological sites, folkloristic initiatives, etc. Notably, not all cultural heritage initiatives, even those promoted by governments, are referenced in the portals denoting a potential problem at the communication level or content provision level between sites.

[1] The list is limited to the languages spoken by the authors. Other e-services may appear through a larger study.

2.2 The Archive

The archive represents the most direct step towards giving the public a first look into the artwork of a country. The archive is comprised of digitalized pictures of artworks catalogued and made searchable through a database interface. Most countries are proceeding into the digitalization of their cultural heritage. For example the Government Art Collection in United Kingdom features 6000 works of art from the 16th century to the present day. Other countries are moving their first steps to take concerted governmental initiatives in this direction. In Sweden, the National Museum has created an infrastructure called WebArt to store information about art objects in the museum collections. WebArt includes paintings, sculptures, drawings, prints, applied art, furniture, design, etc. However, the museum has more than 600.000 objects, the database contains 85.000 records and WebArt features only 22.000 images. This corresponds to approximately 4% of the total object population. The Danish Minister of Culture has proposed a law for the digitalization of the Danish cultural heritage only very recently, on the 4th of November 2004.

2.3 The Archaeological Visit

Some countries, notably Italy and Greece, have a particular focus on the archaeological heritage. This has led towards the development of application for the electronic presentation of these sites. An example is provided by the virtual visit of Villa Adriana in the website of the Direzione Generale per i Beni Archeologici, a department in the Ministry of Culture of Italy. The archaeological visit mixes textual historical information with visual content provided by the Quick Time Virtual Reality (QTVR) technology: a technology for visualization freely available to the public.

2.4 The Real-Virtual Museum

Many state museums are now providing tools for virtual visits from a web-browser. Most museums have adopted for this application the QTVR technology mentioned above. Virtual visits are free of charge but offer very limited information about the objects exposed. In Figure 1 an example is depicted from the virtual visit of the Louvre (Paris, France). They propose nine themes and for each theme they propose some sub-themes that represent a room in the museum. Each room can be "visited" as if revolving around a point in the room. Approaching the artworks is not allowed even thought the artworks are featured in the "selected artwork" section.

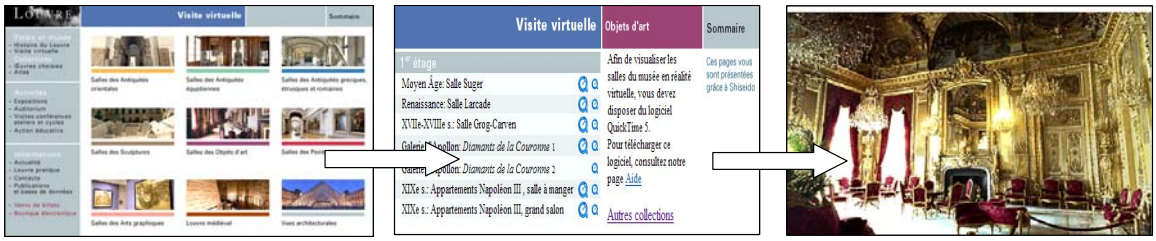

Figure 1: Virtual visit of the Louvre (http://www.louvre.fr visited on 12th November 2004)

A service similar to the one of Louvre is provided by the Uffizi Gallery in Florence, Italy. In the Uffizi case the presentation of artworks is based on the museum map which is also the navigation tool. Therefore the artworks and the virtual tour, though not fully integrated, are incorporated in the same page.

2.5 The Pure-Virtual Museum

The pure virtual museum represents the apex of the technological achievement in the field of digitalization of cultural heritage. The aim of the pure virtual reality museum is to create a digital museum, non existent in reality and populate it with digitalized artworks. This kind of application could well represent the future of preservation and display of cultural heritage for infinite works of art, for infinite visitors and for multiple countries. Not constrained by the boundaries of a physical

museum or country, a pure-virtual museum adopting properly scaleable technology and open standards could become the one-stop site for all the artworks of the world. Notably this technology is extremely complex to implement and the Aquarelle Project (1999) is, today, a one-of-a-kind example. The Aquarelle Project aimed at designing and developing a distributed multimedia information system, offering access to information describing cultural heritage such as painting, sculptures, historical sites and monuments, musical instruments and furniture.

The classification presented above which distinguishes 5 categories of concrete examples of e-services shows that several European countries are making efforts to comply with the Lisbon strategy and are moving, albeit at different paces, towards the digitalization of their cultural heritages. However, given the variety of the applications developed and approaches taken by the different governments it appears clear that the seamless integration of the cultural heritages of multiple countries is a very complex task. This is a task that can be accomplished only through distributed, localized development of content that can be integrated as it is created. In order to achieve this it is paramount for the different governments to develop their content respecting a framework that will bring about this integration capability. The development of such a framework will be the goal of the next part of the article.

3 DESCRIPTION OF THE PROPOSED FRAMEWORK

Among the cultural heritage websites we surveyed only one was specific in the steps taken to build "*a "permanent documentation center" for future study and diffusion of information regarding the study and conservation of the mural paintings of Piero della Francesca and to construct, with the use of computer technology, an organic database for the Project and an interactive multimedia system to be hooked up to the international electronic network and available for public consultation"*. This website was created for a restoration project of a series of artworks of the painter Piero della Francesca (http://www.pierodellafrancesca.it) under the guide of the Italian Ministry of Culture. The explanation extracted from the website pointed at a very complex work of collection of material from multiple sources: text, CAD drawings, and digital picture and the creation of a web of content that could allow the accurate restoration of the paintings of Piero della Francesca, which was the original goal for the project, before it was enlarged to the wider public. Figure 2 shows the multiple sources of data used in the Piero della Francesca project. Upon completion the website featured detailed archives, historical data, electronic rendering of paintings and buildings and virtual visits. In starting by serving a very demanding public, the restorers, the site proposed most of the features that should be included in cultural heritage sites.

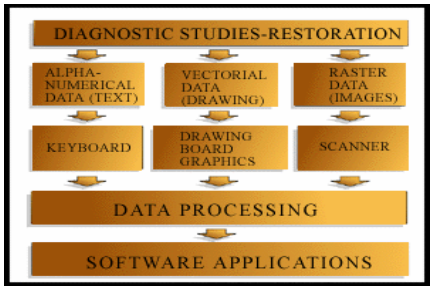

Figure 2 Activities in the project of Piero della Francesca

Based on the ideas of the Piero della Francesca project, the surveys of the cultural heritage initiatives presented above, and theoretical and practical knowledge of systems development we propose a framework for the development of internet sites for cultural heritage based on 3 pillars: 1) Cultural heritage sites are, in essence, information systems; as such, existing methodologies can be adopted and adapted for their development; 2) The impact of websites for cultural heritage increases with the enhancement of content integration from multiple sites: a one-stop cultural heritage site is the goal and compatibility among the finished local products is paramount; 3) Multiple types of public have to be served by these sites; satisfying each group is important to serve the goal of increasing demand for services in the eEurope strategy.

Based on these ideas the five phases of the framework are the following: 1) collection of user requirements; 2) digitalization of cultural content, 3) system interoperability design, 4) cultural content organization and 5) e-Government cultural portal development. These phases are expressed as activities in the IDEF0 (Marca and McGowan 1988) model presented in Figure 3.

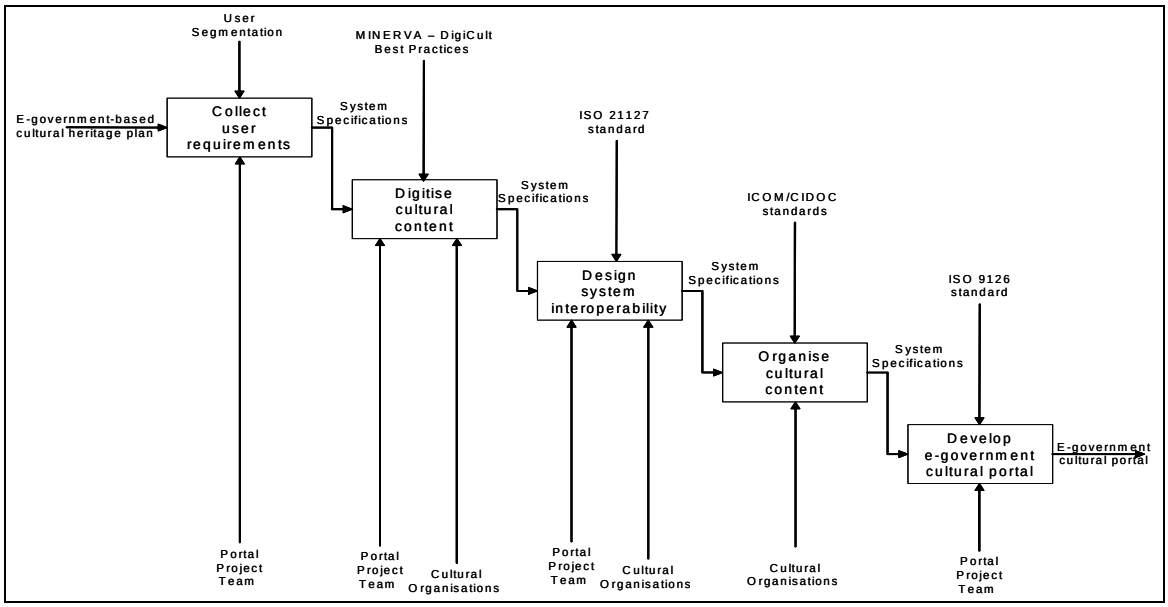

Figure 3: IDEF0 model of the proposed framework – Level A0

The specific characteristics of each activity are presented in detail in the following paragraphs.

3.1 Collection of User Requirements

To design an efficient cultural heritage portal that meets the public needs effectively, it is first of all necessary to define who the public is and understand the needs that have to be addressed. The survey of the cultural heritage initiatives highlighted different groups of users (customer segments). One classification (Dipartimento dei Beni Culturali, Italy) related to the type of the visitor which was classified as internal, private, or corporate. The internal public might for example be the law enforcement agencies accessing the artwork database for research on fakes or stolen material. The public can also be classified according to geographical, demographical and behavioural variables (Sen, Padmanabhan and Tuzhilin 1998). Region and language can be used to make sure that the exhibition is culturally acceptable and the language understandable by our audience. Among the demographical variables, age may be useful to present cultural heritage accurately at every group age[2]. Occupation or community of practice of the visitor may also determine its expectations. The higher the degree of digitalization and the richer the content, the easier it will be to satisfy users with different demands as shown in the Piero della Francesca example where the satisfaction of a demanding group like the restorers allowed to satisfy even a younger public.

Despite a careful segmentation the actual collection of the requirements can result in a quite challenging process. Most constituencies will in fact be unaware of what they want since innovative e-services do not yet exist. For the elicitation of requirements from the final users it is appropriate to engage with the different constituencies in an iterative process using prototypes of interfaces. This prototype-based requirement elicitation should be done independently from the setting of the requirements for the content digitalization where the use of an agreed upon standard is required (see below in section 4.3).

[2] In the Piero della Francesca project there is a game that asks the player recompose fight scenes taken from paintings. This is an example of customization of the content to a young audience.

3.2 Digitalization of Cultural Content

The reasons for digitalization, or more precisely for the digital conversion of non-digital cultural source material, are varied and may well overlap. A resource for guidelines concerning the digitalization of cultural content is the portal MINERVA-MInisterial NEtwoRk for Valorising Activities in digitalization (http://www.minervaeurope.org/). MINERVA is a network of European Union (EU) Member States' Ministries to discuss, correlate and harmonize activities carried out in digitalization of cultural and scientific content for creating an agreed European common platform, recommendations and guidelines about digitalization, metadata, long-term accessibility and preservation. For example the mentioned project of Piero della Francesca was implemented according to these guidelines.

3.3 System Interoperability Design

Concerning this step, we propose the adoption of the ISO 21127 standard (http://www.iso.org/). ISO 21127 is a domain ontology for cultural heritage information. As such, it is designed to be explanatory and extensible rather than prescriptive and restrictive. The standard is intended to cover all concepts relevant to cultural heritage information, but most particularly those needed for wide area data exchange between museums, libraries, and archives. The primary purpose of ISO 21127 is to offer a conceptual basis for the mediation of information between cultural heritage organizations such as museums, libraries and archives. The standard aims to provide a common reference point against which divergent and incompatible sources of information can be compared and, ultimately, harmonized. In this context, we include this standard in our model for the development of an e-Government portal on cultural heritage.

3.4 Cultural Content Organization

In this phase, the cultural content is organized according to its purpose. The categories that have emerged from our survey of existing e-services are the following (please refer to the cultural content part in the bibliography):

- *Primary data of registration and description of cultural objects.* This data refers to basic identification information, classification, physical shape, condition, geographical location, construction date, application, properties and relation with other objects (ref. 2, 3, 4, 5).
- *Administrative information concerning the relevant collection and monument management.* This information is the prerequisite for the management and documentation of monuments or objects which are part of a museum collection (ref. 1, 4, 6, 7).
- *Documentation information of digital products and processes.* To this category belong the meta-data that concern the processes of digitalization, identification, quality and thematic content of the digitalized material (ref 1, 3, 4).
- *Preservation information of the cultural content.* This information refers to meta-data for the long-term preservation of the digitalized material (ref. 3, 6)
- *Publishing data of the cultural content.* The digitalized material is published on the internet and is also stored in optical technology media (CD-ROMs, DVDs). The data included in this category aims at the educational use of the cultural digitalized material and the effective creation of multilingual versions (ref 3, 5).

3.5 Development of E-Government Cultural Portal

Once the requirements have been collected, the material digitalized, and the standards set the time for the actual service development arrives. We envision this service to belong, at least initially, to one of the five e-services catalogued. As such the service development can be regarded as a problem of information system development. In the particular case of internet sites for cultural heritage there are particular conditions that make them different in relation to the needs of traditional websites treated in the literature (Baskerville and Pries-Heje 2004). The needs for quick adaptability and flexibility (ibid)

do not apply in most cultural heritage cases where the data and the user interfaces are rather stable in time. The presentation of the artworks is also quite stable in time and it has achieved a quite agreed upon format. Therefore the development would not have to focus on rapid and continuous development but rather comply with the more traditional system development lifecycle focusing on long term usage: efficiency, reliability, low cost maintenance, and robust functionalities (Truex, Baskerville, and Klein 1999). However, some of the characteristics of websites are obviously ported to cultural heritage sites. The interface must be particularly cured as visitors are varied in age and education therefore particular attention to usability must be taken. Furthermore, standards must be strictly respected as presented above since data might and should be used in multiple sites or in multiple ways in the same site. Being prepared to provide multiple views of the same digitalized material will be a critical factor for the success of cultural heritage e-services over time because the development of views or interfaces will demand much less work compared to the digitalization of content. Finally, particular attention should be posed to the scalability of e-services given the staggering quantity of material potentially available for display.

4 CONCLUSIONS

The way towards the completed digitalization of cultural heritage artefacts is very complex and requires massive work as the project of Piero della Francesca has shown. The positive news is that technologies are available for carrying out all the necessary activities. Digital drawings, digital photography, distributed database technologies are available for data storing and retrieving, complex search techniques can be used to scan for information. The problem of advancement in the cataloguing and divulgation of electronic material does not reside in technology but in organizational traditions and cultures that, knowingly or unknowingly, might be retarding the process and in the recognition that electronic cataloguing and presentation of artwork is not locally limited (e.g. at physical museum or site). Politicians and administrators need to understand that to achieve the goals of eEurope, cultural heritage needs to move from the physical place to the electronic space. We believe that this article provides a solid framework to achieve this goal. The proposed framework is easy to understand: based on IDEF0; clear in its content and in the definition of the resources needed, what rules apply and what are the goals for each activity. It provides, to the willing and open-minded team, the right guidance without being restrictive towards the development of e-services for cultural heritage that are not only effective upon completion for a specific location but that will stay effective in the future and without borders if the standards for interoperability are respected.

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Uffizi Gallery, Florence, Italy: http://www.uffizi.firenze.it
The Louvre Museum, Paris, France: http://www.louvre.fr/
National Museum, Stockholm, Sweden: http://webart.nationalmuseum.se/
Project Piero della Francesca: http://www.pierodellafrancesca.it
Aquarelle Project, http://vcg.isti.cnr.it/projects/miscellanea/aquarelle/3Dvisual.presentation.html

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France: Ministère de la Culture et de la Communication : http://www.culture.fr/ (specific site dedicated to cultural activities)
Greece - Hellenic Ministry of Culture: http://www.culture.gr/
Ireland - The Department of Arts, Sport and Tourism: http://www.arts-sport-tourism.gov.ie/
Italy - Ministero per i Beni e le Attività Culturali: http://www.beniculturali.it/
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