[ars.edu] European network of Cultural Heritage Education Centres

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ABSTRACT
The aim of this project is to provide a strong link between Culture and Education through the establishment of a trans European network of Cultural Heritage Education Centres delivering digital educational objects specifically designed accordingly to different user profiles ranging between pupils, students, mentors and tourists. Education institutions and professionals should be taken into account as well. Spreading knowledge, popularising the Cultural Heritage (both tangible and intangible) is the duty of all humanity. Developing a system that will achieve this task will have a big social impact, it will preserve natural and cultural properties of outstanding universal value and will improve the quality of life. Digital educational objects should even help in preserving cultural diversities. In education, teachers can have all needed supports for their teaching tasks, on the other side students can found all the required help that will allow them to participate and to have more active role in the learning processes.

In order to achieve such result [ars.edu] will establish a Trans European Network of Cultural Heritage Education Centres. Such Centres should be both virtual and physical. The reference model inspiring the current project was originated two years ago on the occasion of the development of the educational web site named [louvre.edu]. The basic idea of this service, addressed to France market, was to provide copyright free customised content suitable for scholars and tutors. Comments, texts were expressly written for this purpose. Additional features such as the "Buro" concept were implemented as well. [ars.edu] will expand and extend the basic concept of [louvre.edu]

KEYWORDS: on line education, cultural heritage, digital educational objects

REFERENCE SCENARIO
The starting point of the [ars.edu] system is [Louvre.edu] and other similar experiences recently carried out at local level. [Louvre.edu] (http://www.louvre.edu) is an educational on line web, launched in 1999 from Louvre Museum, Ministère de l'Èducation Nationale de la Recherche et de la Technologie and Oda Èdition, which makes available exceptional cultural contents copyright free. The main features of [Louvre.edu] that will be kept and reviewed are:

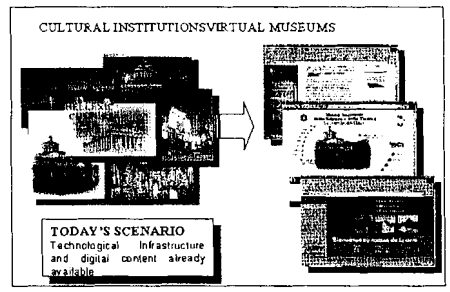
- Museum and library guided tours
- Iconographic and textual resources access
- Guided and free search
- Creation of user "personal gallery" (Bureau)

The project is aimed to extend and upgrade at European
level local experiences. The main features to be develop should be:

- Definition of methodologies and solutions in order to exploit the application to different environments and contents
- Educational supports for developers and customises, pedagogical issues, learning paths
- Methods and tools addressed to select and exploit training and educational contents from content repositories
- Definition of authoring systems addressed to mentors (wizards, templates, etc)
- Management of different users profiles
- User tracking tools and techniques
- Adaptive multimedia (topics, format, level of detail, media, hyperlinks, etc
- Content repackaging on different media (video, paper, presentations, etc)
- Education and training results assessment
- Extension of the Bureau-personal gallery concept (authoring tools, intranet publication, content repackaging, etc)

WHICH OPERATIVE MODEL FOR ON LINE EDUCATIONAL SERVICES?

The efforts to be spent in order to set up valuable educational application are usually considerable. In addition access to relevant content, IPR clearance and, some time, *ex-novo* creation of additional content such as 3D reconstructions or computer-generated animations implies costs and efforts exceeding the aim of the application. On the other side, cultural community is interested in accessing some "objects" in order to further investigate or suggest new theories. Developing educational content we do not need to deal with interoperability of huge data sets spread worldwide, we just need a mentor who picks up or create reference objects (texts, images, 3D models, etc) addressed to the definition of "educational paths". Creation, publication and sharing of "digital educational objects" as a common platform for educational application in the field of cultural heritage are the scope of [ars.edu]. In order to achieve this goal [ars.edu] will create an on line "base of publication" for cultural services. The heart of the project is based on the presentation of the principal "foyers de création" which have marked the history of art and architecture in Europe. The concept of "foyers" at the same time usual and powerful is, in our opinion, the best to let people understand the peculiar nature of the European identity.
The full implementation of [ars.edu] project foresees the set up of collections of digital cultural objects related to a list of "Foyers Artistiques" selected as representative of a specific "learning path" in order to give a view on the European Culture.



Today's scenario: from cultural sites to virtual museums - major part of cultural institutions has already a web site

DESCRIPTION OF SOME ADDITIONAL SERVICES PROVIDED BY [ARS.EDU]

One relevant concept is the development of tools & methods addressed to let the mentor choose relevant "digital cultural objects" and create an effective "learning path". There is no need to create or access huge digital archives in order to implement [ars.edu], in addition major content exchanges between content holders and the educational environment are performed once. Upgrade and integration, of already existent application, will mainly conceive user profiling, adaptive multimedia and content repackaging on one side and the creation of physical Education Centres in order to complement the network via specific facilities and human interaction.

So far the system will be exportable and compatible with several typologies of museums and archives.

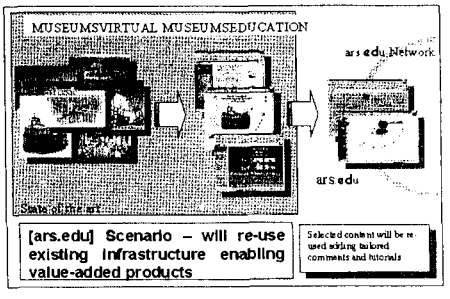
Applications will be interoperable and based on accepted standards and protocols for digitisation and data exchange and allow a global and multilingual access to cultural heritage educational contents. Legal constraints affecting the exploitation of applications (copyright, licensing) will be considered as well and the final goal is, of course, to provide copyright free content on the web (for educational purposes only).

Typical implementations of the system, in addition to the usual one, should be:

Small / medium sized collections to be exploited or promoted even creating a network of related cultural contents. Eg. Museum of pottery in Germany chooses ars.edu solution in order to implement an educational Web site outlining historical production processes, crafts and skill. If there is any similar collection/tradition in Italy ars.edu should emphasize the relation, establish and manage information exchange;

Small collection of heterogeneous objects not so relevant as a whole to be visited frequently should be make available and shared using [ars.edu]. This will multiply the opportunities to be included in "learning paths" enhancing the visibility and public interest for the collection;

There are some "artefacts" not easy to exploit or even communicate, portions of the landscape such as "Les chateaux de la Loire" or the "Via Francigena". Using ars.edu it will be possible to create an educational service exploiting the content, the context and logical/spatial relations. So far it will be possible, for territorial cultural institutions (landers, regions, provinces, etc) to balance and distribute the number of visitors on several different sites enhancing the "cultural visibility" of hidden sites through a set of communication/education services provided by [ars.edu].



[ars.edu] scenario – will re-use existing infrastructure enabling value-added products

AN INSTRUMENT FOR PEDAGOGIC AND CULTURAL PROJECTS

As an educative and cultural site, [ars.edu], offers to colleges and schools, but also to private people, a collection of visual, textual and sound resources of great artistic foyers which marked the artistic history of Europe.

It will propose in six languages a detailed documentation about 1000 essential works and 400 important monuments: a pedagogic instrument rich of 6000 images together with a collection of documentaries which group together biographies of artists, information about the works and the presentations of great artistic foyers, of syntheses about different periods of history of art and architecture. [ars.edu] allows to develop an educative research giving to everyone the means to collect, choose, personalize and communicate freely.

Information may be accessible in multiple ways; you can search by theme, work, or starting from the artistic foyers and arte facts, monuments, which are related to it. At any moment you can relate the work to its historic context or, starting from a foyer, reach a particular object. Users can on the other hand personalize a selection that they will find every time they repeat the consultation to the site, or page and edit their research.

After inserting access code on the identification screen, the user arrives on a welcome page where lies the summary. The site is divided into four parts: Europe, Art and Architecture, Bibliotheca and Personal Gallery. A presentation text describes their content.

The part called Europe presents an historic and cartographic landscape of the main artistic foyers of Europe from the ancient times. From every foyer, we can assist to a presentation of the most important works and monuments related to this artistic centre.

The part called Art and Architecture, in which the most important action is the research of images, offers a visual thesaurus of works and spaces of architecture. This way a work becomes accessible beginning from its denomination, but also from its techniques, or also from its period and its author.

The selection of images is related to information about the work and historical presentations of artistic foyers.

On the other hand a direct access to the texts thanks to the space called Bibliotheca, which groups together all the texts of the site: information, biographies of the artists, synthesis of the different periods of the history of art, of the schools, of the great civilizations.

At the end, [ars.edu] offers a Forum, space of expression and exchange for the users. They can also be in direct connection with the educational centres and share the other their discoveries, their results and create a partnership of schools, which work on a common pedagogic project.

The site is, in addition, proposed to families and associations. Accessible by Internet subscription, [ars.edu] gives them a set of visual, textual and sound resources about main arts and monuments of the European culture, with that the user can:

- Discover the artistic history of Europe, the essential works, the principal foyers and creations centres, the artists;
- Plan a visit, a course, an exposition, a speech at school or at home;
- Create some documents in groups, take part to pedagogical exchanges among institutions;
- Plan cultural travels;
- To be informed and trained in the

field of arts and heritage for his own general culture, his curiosity or simply for his own pleasure.

The presentation of the works and monuments has many functions, allowing reading texts, to explore the details or to listen to audio documents. At any moment, you can go back from a work to the foyer it belongs. From this foyer, you can examine other works, read documents associated to this foyer, visit other creations centres... and see the different works of a period of a chosen country. The function of selection allows creating some diaporama that create an own museum of the user.

THE EUROPEAN MARKET FOR EDUCATION & CULTURE

Thanks to the work carried out care of the European Commission both in the field of ICT for cultural heritage (eg. DIGICULT framework) and educational multimedia (eg. Multimedia Educational Task Force) there is a good visibility on the overall scenario. In addition the European Information Technology Observatory (EITO) is to be considered as a reference for European market definition. The first condition for the development of such a market is a close and effective co-operation between those actors who are custodians of the cultural heritage - mainly of course museums, galleries and archives - and those actors who provide the means for ICT dissemination mainly commercial companies operating in the fields of information technology, telecommunications, broad casting, etc.

This is a major challenge, given the completely different business cultures in which these two sectors lie and their different knowledge background and expertise. Historically, museums have been suspicious of industry - fearful of a vulgarisation of the heritage and of being commercially exploited; while industry in turn accuses museums of being impractical and out of touch with harsh commercial reality.

Trying to summarise the potential educational market in Europe we can say that: 350 millions people; 4.7 millions teachers; 350000 schools; 67 millions pupils; in addition we have: 15 countries speaking 12 languages and three different cultural models (Mediterranean, German and Nordic).

On the Cultural Heritage side, in the last years computer graphics, hypermedia and telecommunications were applied in exploitation of museums, art galleries, architecture and other kind of works of art. Network access to museums and galleries seems to offer both easier access to cultural heritage and new revenue for its preservation and display. Many relevant players both in the Museums and ICT communities invested time and resources creating pilot projects and applications ranging between 3D reconstruction, image based rendering and virtual museums.

We are now in a position to consider if such investments are effectively useful and really increase and diffuse knowledge in the arts, sciences, and history and if they satisfy users' requirements.

Do virtual museums really provide added value to end-users? Museums, content providers and users are ready and willing new technologies for cultural heritage?

One of the usual tests is to evaluate the follow up of a visit to a museum (real or virtual), exiting the museum do we own "something" more than before the visit. One of the possible "catalysers" in order to ensure an added value is related to educational applications. Such services should be used both at home and on site. So far up until now there

are many digital cultural data repositories, usually Web sites potentially suitable to join an aside Educational service. One of the key points is enjoy a set of methods and tools in order to select a limited amount of artefacts to be used in order to create a "learning path"

The communication process devoted to cultural heritage reflects a reasonable degree of complexity. We can present a work of art and propose an interpretation established in advance or try to offer to visitors all the necessary elements in order to evaluate autonomously the work of art. Some of the main difficulties inherent in the communication process regarding cultural heritage arise from the fact that usually the work of art pertains to a different historical and cultural context and it is nowadays probably situated in a different place and the original place is no more accessible. One of the main attentions that the communication manager must take back is the rebuilding of the original context, in such a way that it is possible to 'communicate' the work of art together with all such elements that may render an objective evaluation. Information science, specifically hypermedia and computer graphics should offer a fertile ground to develop such applications. In the rebuilding of the typical context of the work of art another important aspect specifically linked to computer graphics and 3D models is represented by 'space contextualization' which means the possibility to place the digital 3D object in the right location preserving the full set of spatial relations amongst the model and all other objects available on the scene. Advanced telecommunications applications provides some of the answers to the new education and training requirements: educational information (educational structure description, entrance requirements, curricula and syllabi, etc...), information on the use of education software materials, access for persons geographically, socially or professionally isolated, provision of "just in time" training which adapts itself to the needs of employment, improving employees flexibility, new teaching and learning methods which are more interactive and more customised to individual needs. In order to make possible the successful development of this market a number of conditions have to be fulfilled. Potential investors need to understand the potentiality of the return on investments. Companies should look at their investments in the field of art not only as philanthropic programmes but also as multiplier for potential market actions. While indeed many museums and galleries in Europe operate on a non-profit basis this is obviously not true for the companies which develop and market the technology necessary for the multimedia exploitation of European cultural heritage. These companies must be assured that a fair return on investment can be made.

Advanced distance education and training services should then be made accessible to individuals, schools, colleges and cultural institutions. Training centres with special multimedia and virtual reality equipment should be set up and made readily accessible across countries in order to provide courseware and training services for museums, education systems and public administrations.

TECHNOLOGICAL HIGHLIGHTS

Every day the population of the Internet community is expanding. On the other hand Cultural Organizations and Content Owners present a slow rate of

adaptation to the new technologies mainly for two reasons:

- Scepticism for the case of electronic theft.
- Lack of Infrastructure for the appropriate presentation of the sensitive cultural topics.

This project's goal is to provide participants with the necessary common software infrastructure to:

- Maintain all content available to end-user and value-added applications / services. This will provide a uniform way (instructions and tools) for content providers to digitise / author, organize, maintain and make available content both for re-use and enhancement.
- Provide transparent access to content and content integration
- Provide for the management and protection of intellectual property rights, especially for digitised cultural content of high value made available on the Web
- Support the operation and collaboration within the human resources network established through the project.
- Perform the actual content acquisition.

Repositories

Applications that integrate all content provided by content providers in a format that can be reusable through value-added applications. Each repository functions autonomously. All content is in a presentation independent format – to the highest extent possible. Leading edge technologies (XML, XSL, RDF and so on) will be extensively employed. Main services that will be provided in the repositories are: querying (e.g. for HTMLs, via the Harvest systems, for XMLs, via Visual XML Query, for DBs, via standard SQL interfaces), data processing (e.g. Visual XML Tree, Visual DTD, HomeSite, native DB tools), other content conversions (e.g. Visual XML Creation, FOP, Xsplit, Versioning (e.g. RCS), Access Control (e.g. WWW server security rights)

The Metadata (MD) layer acts as the "glue" or the common denominator (abstraction layer) among our different underlying repositories, by having all repositories "export" or publish the metadata related to their resources. This use of metadata to enhance the discovery of electronic resources is widespread. Metadata can be navigational, schematic and associative (descriptive, restrictive, supportive, etc.) and are arranged within metadata sets. A well-known, domain-independent set, which is actually a standard, is the Dublin Core (DC), with 15 elements for abbreviated descriptive cataloguing. DC is, however, not enough to offer an integrated and more complete view into our resources. We further need our own metadata sets, with the following functionalities:

- application domain – specific content description
- more consistent content description (using auxiliary sets such as glossaries, thesauri)

The ontologies examined are pertinent to the domain of Culture, and included ICOM/CIDOC International Guidelines for Museum Object Information. Research on cultural metadata included the results of several cultural projects (e.g. Aquarelle). The metadata sets designed and implemented in a database repository include:

- Dublin Core
- Culture-specific (materials, artistic, glossaries of terms, keywords)
- Schematic (classes of XML content, elements of DTDs, database tables)
- Geographic-position related

Since metadata are stored within a relational database, it is easy to support features such as multiplicity of metadata fields and qualifiers (e.g. the LANG qualifier of Dublin Core). This also reduces data redundancy and improves integrity, as often-occurring text (e.g. keywords, locations) can be kept in separate sets and re-used by being linked to metadata fields, instead of being repeated in each metadata record.

Authoring systems addressed to mentors

The authoring system is designed to meet the need for a consistent and effective automation of the production of interactive multimedia titles of structured type, in which the behaviour of the user interfaces, the modes of navigation and interaction, the visual and media effects and the access to the information contained in the electronic book can be handled analytically and structured into a system of relational databases. The resulting data structure provides opportunity of sharing the project between several authors making in this sense possible the development of multimedia products in an enterprise context, which will rely itself on a common base of code sources and on a replication, on server or local, of the complete general project. The multimedia data, described in XML will be, as soon they'll be instanced, stored in the object oriented RDBMS. Highly innovative will be the definition of a DTD for the description of multimedia products considered as a set of media sounds, video images, text and the interactions ad actions that bind them together. The authoring system, developed on an object oriented RDBMS permits the guided insertion of data in several tables by the use of elaborate multi-component forms.

User tracking and profiling

The system is able to extract user's preferences and to catch his level of interest among the different contents, thanks to a careful analysis of his behaviour during the navigation. Users are classified on the bases of similar choices and expressed interests, in this way enabling, automatically or semi-automatically, the system administrator to propose information, matters and navigation personalized guided tours according to the needs and the level of experience demonstrated through the navigation modalities. Contents and proposed services adaptation to user's needs is a fundamental factor to favour an easy and personalized access to a complex information archive. On a parallel side there is the requirement to adapt pages information to user's navigation ability and to his knowledge level on the treated subject matters. The automatic ability of grouping and cataloguing users can suggest the implementation of services perfectly responding to the user needs in term of quality and quantity of information contained, so he won't be tired and leave the navigation. The project purpose is not only to realize a software platform perfectly corresponding to the above cited exigencies, but also flexible and customisable by the mentor himself.

The system must permit to analyse the navigation parameters (such as currently opened page identifier, session time, access time, banner utilization, stay on page time, search form...) which are contained in the web server log files and to relate them to a Data-base of proceeding registered data regarding each page. The realization techniques will be based on taxonomic trees describing the existing links among the several classes of contents assumed for user profiles definition.

The system must be able to extract, starting from incomplete indications, a range of indicators, which describe the overall behaviour of each user and characterize his interests' profile. The semantic hierarchy embedded in taxonomic trees permit to overcome a mere statistic approach, while the hierarchic link among contents classes permit to have an indicative general picture just starting from the first data analysis. The final user profile determination will use advanced fuzzy logic technologies enabling the identification of each user level of interest starting from the elementary parameters memorized in the logging database. Fuzzy engine is of an adaptive kind in fact the parameters which regulate its functioning are extracted from an automatic analysis of historical data to adapt the system to extremely differentiate contexts, reducing difficulties and insertion time in different operating environments.

Adaptive Multimodal Interaction

The adaptive multimedia can be activated by user profile module or by user choice. The Automatic content generator is the result of other pages abstract and result of user search. The user can set the level of detail of the proposed document: general, tutorial and detailed. General is only a survey of the topic, tutorial is a complete course, detailed shows a detailed information set. Adaptive Information Visualization comprehends all techniques, which manage visualisation settings of contents, i.e. graphic layout. The user can set the kind of page presentation and navigation model: Simple, Expert and Master. Simple is simple pages presenting only few relevant information, Expert is a rich abstract and Master is a portal-like model, containing a large mass of information from several sources. The navigation model set up can be defined into user profile or can be chosen from the user himself. Another kind of information visualization can include the creation of user-adaptive functional layouts i.e. tourism, learning, research, news, others: the user defines the objective of the navigation and gets the specific page. For example: if the user choose "tourism", in his page there will be a geographic map showing where he is; if the user wants to learn, the page will show a logical map of the contents. etc. The last sector of adaptive multimedia comprehends all techniques for the development or management of navigation-help tools.

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