IST-2002- 507382

EPOCH

Excellence in Processing Open Cultural Heritage

Network of Excellence

Information Society Technologies

Activity 4.2 Standards
D.4.10 Standards and their roles in EPOCH

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Date of document: 10th April 2006

Start date of project: 15 March 2004
Duration: 4 Years

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Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	X
CO	Internal Confidential, ONLY for members of WP1 Management Committee and EPOCH Executive (not for transmission to the Commission Services)	

Contents

Executive Summary

EPOCH's activity on standards has included a number of events since March 2005. It started with a workshop at CAA2005 in Tomar (March 2005), continued with a workshop at VAST2005 in Pisa in November 2005, ending with a workshop at EVA Florence in April 2006. A symposium on credibility issues for 3D heritage models has been organised in London in January 2006 and a seminar on "Ontologies for the Humanities" took place in Florence in the same month. Other activities were carried on during other events.
Training activity on standards includes a Summer School on "Standards in Archaeological Documentation" held in Prato in June 2005.
Since the beginning of March 2006, a discussion list on technological standards has been activated, participated by some 20 EPOCH researchers.
Other activities include a survey on usability and the continuation of the support to the Ename Charter. A new Charter has been proposed for discussion, concerning the use of 3-dimensional visualisation in the research and communication of cultural heritage.

Research on standards has concerned three sub-domains: documentation standards, technological standards, usability and design.
Activity on documentation includes surveys on the use of standards and after a preliminary survey a study has been commissioned to one of the partners. A mapping exercise has been performed on official documentation systems used in Italy, and it is due to continue on those adopted by other European countries. The goal is to verify the possibility of mapping such systems to CIDOC-CRM, the draft international standard for heritage documentation.
As far as technological standards are concerned, introductory guidelines to SVG and X3D have been produced to support non-technical users, while a third 3D standard, COLLADA, is the subject of attentive analysis, to produce an "EPOCH profile" for 3D heritage objects.
The surveys on usability and design produced interesting results reported here; they will be continued to enlarge the sample of responding institutions.

Results obtained so far are indeed encouraging; there is much work to do, but standards may be a field where EPOCH's contribution may have a substantial impact on policies and practices in the Cultural Heritage domain.

1. Overview: EPOCH's activity on standards

In year 2 EPOCH has organized a number of events on standards, either within other conferences or as stand-alone symposia.

At **CAA2005** (Tomar, Portugal) a session of standards has taken place (23 March 2005, http://www.caa2005.ipt.pt/I9Abstract.htm#Standarts). The session was jointly organized by EPOCH and the University of Berkeley, with the participation of outstanding researchers from Europe and USA. During this session, participants discussed main issues concerning the current adoption (or, better, non-adoption) of standards for archaeological documentation and established an agenda for further work. Besides, several papers on standards were presented by EPOCH partners in the plenary (so-called "I9action session") on standards.

At **VAST2005** (Pisa, Italy) there has been a workshop on standards (8 November 2005 - http://vcg.isti.cnr.it/vast05/program.php). Discussion here has focused on technological standards, with a discussion paper presented by Sven Havemann on Collada (the emerging open standard Digital Asset schema for interactive 3D applications, https://collada.org), and on issues of credibility of archaeological reconstructions, with two position papers by Franco Niccolucci and Richard Beacham. Some 50 people have attended the workshop.
As a result, an on-line discussion on 3D technological standards has been opened within EPOCH with the creation of a 3D Task force (also working under WP3.3 as far as Common Infrastructure issues are concerned) and the establishment of a wiki summarizing the outcomes of the discussion.
As far as the other thread (credibility) is concerned, it appeared that work was indeed still necessary to establish accepted credibility criteria, and general guidelines were much needed, involving not only the archaeological community, but also researchers from other areas who might contribute methodologies for recording the actual process of interpretation and archaeological reconstruction. To proceed in this line, a further meeting was planned, to be jointly organized by EPOCH and KCL in London.

In Pisa, it was also concluded that technicalities necessarily involved in standards do not facilitate heritage professionals, the 1997 statement by Alicia Wise being still valid: "*A growing number of archaeologists know about standards. The bad news is that in most cases it still isn't clear why these standards are useful or how they are best applied in archaeology.*" Thus EPOCH's activity needs to produce introductory material and include into discussion concrete examples showcasing the usefulness of standards. In this line, we organized a **seminar in Florence** with the collaboration of the Faculty of Architecture, University of Florence on "*Ontologies in Humanities: Archaeology, Architecture and Cultural Heritage*". The seminar took place in Florence on 27 January 2006 with some 30 participants. A team from the CNR Laboratory for Applied Ontology (Nicola Guarino, Aldo Gangemi and Stefano Borgo) were invited speakers, together with Andrea D'Andrea (CISA, EPOCH partner) lecturing on *Ontologies for Cultural Heritage* and Chiara Cirinnà (Faculty of Architecture, University of Florence) lecturing on case studies in Architectural studies. Some 10 contributions were collected in response to a call for papers, concerning diverse fields of applications. Papers will be published in a proceedings volume. The main goal of the seminar was to reach researchers and professionals possibly interested in standards but not directly involved in them; to coordinate efforts at a national Italian level; to disseminate EPOCH's activity beyond the partnership.

As a follow-up to this work, Andrea D'Andrea is presenting a paper at the workshop on "Ontology Based Modelling in the Humanities" organised at the University of Hamburg on 7-9 April 2006 (http://www.c-phil.uni-hamburg.de/view/Main/OntologyWorkshop).

On the other hand, the **production of documentation** on two relevant technological standards in computer graphics has been commissioned, SVG and X3D. For these topics both introductory material and case studies of applications to cultural heritage are in fact lacking. The two documents have been prepared and will be published on the web site. A preliminary draft is attached to the present report.

Relating to this training activity on standards and documentation, PIN has organized in June 2005 a one-week **Summer School on "Standards in Archaeological Documentation"** in Prato, Italy, attended by some 25 young researchers from Greece, Poland, Romania, UK, Australia, Sweden and Israel at PhD student level. The faculty included experts from several EPOCH partners. The school focused on such issues as the technology used for archaeological documentation, standardization and related problems. Students were invited to bring some research problem of theirs, discussed during a seminar.

Follow-up on credibility has taken place at a meeting in January. KCL and PIN (EPOCH partner) organized the **London Symposium and Expert Seminar** "Making 3D Visual Research Outcomes Transparent", which took place on 23-25 January 2006 at the British Academy and CCH at King's (http://www.kvl.cch.kcl.ac.uk/Symposium/index.html).
Some 30 people attended the meeting, with a vibrant discussion on the topic that eventually produced, in the last day experts' seminar, a draft charter for the use of 3-dimensional visualisation in the research and communication of cultural heritage named "The London Charter".
After preliminary circulation, a draft has been produced to be further discussed at the workshop on standards planned for the April EPOCH meeting at EVA Florence. The London Charter is a direct outcome of EPOCH's activity and the provisional technical secretariat has been established at King's (a forthcoming EPOCH partner) with prof. Beacham's research team, while the charter committee will be chaired by Richard Beacham and Franco Niccolucci.

A separate thread has concerned usability of IT applications. On this regard, partners University of Italian Switzerland at Lugano, the Polytechnic of Milano and IBC have carried on a **survey on usability** whose results will be presented and discussed at EVA as well, and are summarized below. Results are attached to the present report

Also the activity on the **Ename Charter** has actively continued. The Ename Center (EPOCH partner) is fostering its adoption as an ICOMOS charter, establishing a web site for its dissemination (http://www.enamecharter.org/) and successfully organizing an international symposium on the Charter in May 2005. More than 160 papers were submitted, most acknowledging the Ename Charter as a standard for heritage interpretation. At the conclusion of the Symposium, held in Charleston, South Carolina, USA on 5-8 May 2005, a declaration was formulated describing the main points of the conference discussions and offering continued support for the ICOMOS Ename Charter Initiative. The Ename Center has recently been appointed as Technical Secretariat of the ICOMOS International Scientific Committee on Interpretation and Presentation.

Apart from public events, research on standards has continued in the three areas of documentation standards, technological standards and usability. For the documentation area,

synergies are envisaged with the activity required for the AMA Newton project, aimed at creating mapping tools for archaeological documentation to CIDOC-CRM. Such activity has produced substantial results that are summarized below and attached to the report. Technical standards have a strong impact on Common Infrastructure as already noted, and joint activity is ongoing.

In the following chapters, the results produced by EPOCH in the three standards areas have been summarized. Detailed documents are enclosed as attachments.

2. Documentation standards

Activity on documentation standards has focused on understanding the relationships among documentation regulations adopted by different European institutions, sometimes at a national level, sometimes just locally or by individual institutions, and the internationally accepted standard for heritage documentation CIDOC-CRM.

It emerged that a deeper analysis might provide better insight in the use of standards in Europe in the archaeological and museum domain. For this reason a more detailed survey has been commissioned to partner Oxford ArchDigital, and the report is due to be completed in May.

This report aims to provide a unified and topical reference guide to the current state-of-the-art in cultural heritage documentation, specifically those sectors associated with material heritage: Archaeology and Museums. It is intended to capture the current, collective knowledge of European heritage practitioners for the purpose of creating a single professional reference for documentation standards. It also aims to broaden the awareness of these standards, and to encourage continued dialogue across national and regional boundaries.

The scope of the survey is dictated by four considerations:

1. **Type:** the survey will report on standards for cultural heritage documentation only. Documentation standards that are not specific to cultural heritage, but are nonetheless widely employed by the cultural heritage community, will be included as a second priority. The survey will not address specific file formats.
2. **Domain**: the survey will include only those standards employed in the archaeology and museum communities; libraries and archives will not be addressed.
3. **Use:** only those standards that have been created by, or are supported by, mutual agreement of a professional community will be addressed; the survey will not include project-specific or vendor-specific implementations. The report will be topical; included standards will be in use, or forthcoming.
4. **Region:** as a matter of practical necessity, the survey will focuses on standards employed in Europe. While those employed elsewhere are equally valid, and will be included where possible, the scope of the initiative does not provide the means for a wider survey.

The survey aims to act as an initial point of reference, and does not attempt to duplicate information easily found on the web or elsewhere. The information provided to the reader therefore addresses those items which are of specific interest to the domain practitioner:

- Geographical and chronological scope of the subject: is the standard intended to document material culture from a specific time and place?
- Summary: a short description of the standard and its history.

- Where it is employed: what organisations are using it, and where is it seeing active use.
- Documentation Format: what format does the documentation take: for example, the standard may be a text document describing units of information, or it may be provided as an XML schema or DTD.
- Availability: how can it be obtained, under what license, and at what cost?
- Authority Lists: what standardised vocabularies are employed by this standard?
- Language: In what language(s) does it exist?
- Further reference: a jumping off point for additional, more detailed, reading.

In the meantime, the activity has focused on the CIDOC-CRM.

CIDOC-CRM is presently at ISO FDIS status, i.e. it is a Draft International Standard (ISO 21127:2006) in Final format, registered for formal approval.

The official ISO documentation summarizes as follows the features of CIDOC-CRM.

> **ISO 21127 Information and documentation -- A reference ontology for the interchange of cultural heritage information**
>
> ISO 21127:2006 establishes guidelines for the exchange of information between cultural heritage institutions. In simple terms this can be defined as the curated knowledge of museums.
>
> A more detailed definition can be articulated by defining both the intended scope, a broad and maximally inclusive definition of general principles, and the practical scope, which is defined by reference to a set of specific museum documentation standards and practices.
>
> The intended scope of ISO 21127:2006 is defined as the exchange and integration of heterogeneous scientific documentation relating to museum collections. This definition requires further elaboration:
>
> - The term "scientific documentation" is intended to convey the requirement that the depth and quality of descriptive information that can be handled by ISO 21127:2006 need be sufficient for serious academic research. This does not mean that information intended for presentation to members of the general public is excluded, but rather that ISO 21127:2006 is intended to provide the level of detail and precision expected and required by museum professionals and researchers in the field.
> - The term "museum collections" is intended to cover all types of material collected and displayed by museums and related institutions, as defined by ICOM. This includes collections, sites, and monuments relating to fields such as social history, ethnography, archaeology, fine and applied arts, natural history, history of sciences and technology.
> - The documentation of collections includes the detailed description of individual items within collections, groups of items and collections as a whole. ISO 21127:2006 is specifically intended to cover contextual information (i.e. the historical, geographical, and theoretical background that gives museum collections much of their cultural significance and value).
> - The exchange of relevant information with libraries and archives, and harmonization with their models, falls within the intended scope of ISO 21127:2006.
> - Information required solely for the administration and management of cultural institutions, such as information relating to personnel, accounting, and visitor statistics, falls outside the intended scope of ISO 21127:2006.
>
> The practical scope of ISO 21127:2006 is the set of reference standards for museum documentation that have been used to guide and validate its development. ISO 21127:2006 covers the same domain of discourse as the union of these reference documents; this means

> that data correctly encoded according to any of these reference documents can be expressed in a compatible form, without any loss of meaning.

From the above it is clear that the intended scope of CIDOC-CRM encompasses museums and museum collections. Indeed, almost all of the (few) existing applications of CIDOC-CRM (listed at http://cidoc.ics.forth.gr/uses_applications.html) concern museum environments.

CIDOC (the ICOM Documentation Committee) has established an Archaeological Sites Group that produced a draft Core Data Standard for Archaeological Sites and Monuments in 1995. The document was widely circulated at those times and discussed at a colloquy in Oxford in September 1995, organized by the Council of Europe and RCHME. Apart from the paper version (available through CIDOC), all links on the Internet to an electronic version are broken, including those on the CIDOC-CRM site, on the CIDOC site and in several other lists (e.g. ADS, University of Glasgow, and so on).
Since then, revision work is being announced as in progress but not yet concluded.

However, a number of papers (some by the authors of CIDOC-CRM) have proposed extensions of the Reference Model to topics pertaining to archaeological investigation and documentation, like epigraphy. In particular, Paul Cripps from the University of Southampton (UK) has established a model mapping the data structure currently used by the Centre for Archaeology of English Heritage onto CIDOC-CRM, and Nicholas Crofts has created a documentation model of historic buildings based on CIDOC-CRM for the city of Geneva. Since latter papers have had a limited circulation and are rather difficult to obtain, we worked on draft copies provided informally at presentations.

We started from excavation documentation and considered official data models currently used in Italy, using an improved version of Cripps' form to develop and document a correspondence of these data models to CIDOC-CRM. The results are shown in Appendix 1.
It is planned to proceed with other data models provided by partners for other countries, notably for Israel, Romania and The Netherlands..

Concerning Italy, the source for current documentation models is mainly the manual issued by the Italian Government in 1984 trough the Central Office for Catalogue and Documentation. In addition, all the entities introduced by scholars since then have been examined.

Archaeological entities have been documented using a form as the following one:

ENTITY-TAG	CONCEPT	CRM-ENTITY
AIE_00 Archaeological Italian Entity–tag	Identification of tag's base-concept	Corresponding CRM-entity

FIELD PROPOSED BY	Indication of the public body that proposed the field

NOTES	Explanation of the meaning and usage of the entity

RELATION	WITH	NOTES
Name of the property to be used with the entity	Related entity	Explanation of the relationship

DATE OF PROPOSAL	dd/mm/aaaa	MODIFICATION DATE	dd/mm/aaaa

A similar form has been used to document properties:

PROPERTY -TAG	CONCEPT	CRM-PROPERTY
AIP_00 Archaeological Italian Property – Tag's name	Identification of the tag's base concept	Corresponding CRM property

FIELD PROPOSED BY	Indication of the agency that has proposed this specific field

NOTES	Meaning and use explanation of the tag

DOMAIN	RANGE	NOTES
Entity- from name	Entity-to name	Relationship explanation

PROPOSAL DATE	dd/mm/aaaa	MODIFICATION DATE	dd/mm/aaaa

It must be underlined that this the first time that such a formal analysis is being performed on the official Italian documentation system and apart from the proposed mapping to CIDOC-CRM it has a value in itself since it allows the formalization of the documentation system as an ontology, or the definition of a scheme (RDF or XML Schema) for it.

The current version of the working document must be considered a Final Draft, although revised thoroughly. It will be further refined with a twofold internal review process:

- firstly, it will be discussed at an internal developers' seminar planned for April 2006, to finalize technical consistency and assess proposed extensions; the results of the analysis of the deriving ontology with Protegé will be also discussed with developers.
- secondly, it will be discussed with external experts from the archaeological and the documentation community.

This review process needs to be managed by the team currently working on it at PIN and other partners, because much of the discussion will take place with local stakeholders and mainly in Italian. Maintaining the alignment of the two versions, the English and the Italian one, is indeed a heavy burden and delays the work, but it is strictly necessary, not only to facilitate comprehension by local professionals, but also to acknowledge local ownership of the results and facilitate official acceptance and implementation – a framework familiar to European procedures.
For future work, the necessity of having two such versions of the mapping document, in the local language and in English, will be decided case by case: it is likely to be necessary for all Latin countries, it is probably unnecessary in Israel, and must be verified for others.

After this procedure (expected to complete in 1-2 months), the result will be delivered to EPOCH, and then reviewed using the EPOCH quality assessment procedure involving the Review College.

However, the mapping document is already a very useful tool and highlights some important points.

The first outcome concerns the coverage of CIDOC-CRM of all entities necessary for documenting archaeological excavations. The first concept which looks difficult to integrate within CRM is the US, Stratigraphic Unit, or "Context" as it is often called in UK. For this new entities may be proposed (the acronym AIE stands for Archaeological Italian Entities):

AIE_13_US and AIE_49_USM (for buildings), both to be mapped onto a new CRM entity E00_CONTEXT. Also AIE_89_USN (for negative units) is being proposed in a similar way.

There are two additional concepts for which a correspondence is failing: the *Fact* and the *Set*. These two concepts correspond to groupings of Stratigraphic Units and have been introduced by the French archaeologist Michel Py in his Syslat system, which has been used in Italy as well. For these two entities a corresponding extension in CIDOC-CRM is being evaluated.

As far as properties are concerned, i.e. relationships among entities, a set of new properties might be proposed to represent stratigraphic relationships. Details are given in the attached document.

After this first matching of Italian national documentation standards, or practices, with CIDOC-CRM, it results that:

- CIDOC-CRM works very well with most archaeological entities defined here in an excavation framework.
- It shows gaps as far as stratigraphy is concerned. This is no surprise, because it was conceived for use in a museum framework, where the notion of stratigraphy is irrelevant or absent. Extensions to include such important concepts appear reasonable and not alien to the overall philosophy of the CRM ontology. It will be necessary, however, to agree on terminology and functions of the newly proposed entities.

For the second point, the solution proposed by Cripps consists in considering layers (also known as US or Contexts) as “space” (CIDOC-CRM E53), and resolve stratigraphy with the relation “borders with” (CIDOC-CRM P122): “physical context relationships can all be seen as specialisms of the generic borders with relationship”. This avoids any extension to the CRM.

However, as stated elsewhere (N. Crofts, “Using the CIDOC Conceptual Reference Model for integrating heterogeneous data sources - applications developed for Geneva's department of historical sites and monuments”, CIDOC-ADIT Conference, St. Petersburg 1-5 September 2003) “The CRM design also provides *extension* mechanisms whereby domain specific requirements can be incorporated without leading to incompatibility.” and the definition of CIDOC-CRM states on page i that “users are encouraged to create extensions for the needs of more specialized communities and applications.”

In sum, extending or not extending seems to be just a matter of convenience: not extending avoids possible duplications; extending stresses the peculiarity of concepts and may better “capture the richness of cultural information” (CIDOC-CRM definition, page ii). A discussion in EPOCH among documentation experts will allow to reach a decision.

3. Technological standards

The activity on Technological Standards is largely carried out jointly with WP3.3 – Common Infrastructure. Here we will briefly report on some activities developing in parallel, and relating to the spread of technological standards. The present report will also summarize those parts of the activity on 3D standards mainly pertaining to the impact of the adoption of standards on Cultural Heritage applications.

One of the issues concerning the use of standards, in particular the technological ones, relates to the fundamental question of "*why these standards are useful*" and why heritage professionals should care of them. We claim they should. It is however difficult to raise their interest and awareness when the documentation is full of technicalities, is not conceived for non-expert use, and lacks of examples in the specific domain. Therefore we thought that it was necessary to provide some introductory documentation explaining what such standards are and why should heritage professionals be concerned with them.
a) **SVG.** As it is well known, SVG is a language for describing two-dimensional graphics and graphical applications in XML. SVG 1.1 is a W3C Recommendation and forms the core of the current SVG developments. The most likely application of SVG in the heritage domain probably concerns archaeological drawings and GIS. For this reason the introductory guide focuses on mapping and conversion from proprietary systems to SVG-based ones. The guide aims at providing the necessary background to appreciate the language, and to serve as an introduction to further reading, if required.
A draft version of the SVG guide is attached as Appendix 2.

b) **X3D.** X3D is an Open Standards XML-enabled 3D file format to enable real-time communication of 3D data across all applications and network applications, with provisions for extensibility related to vertical markets: currently, those for Medicine, CAD and Simulations are supported, others include GeoSpatial, Education, Entertainment, and Technical Training Technical Documentation. The lack of good user documentation for X3D – which substantially relies on the community of users of former VRML, of which it may be viewed as an XML-based derivative – makes it difficult to appreciate its advantages from a user's perspective. It seems also to have inherited from his ancestor a poor acceptance by the computer graphics community, where mentioning it often causes raising an eyebrow. On the contrary, there is potential for exploitation in the Cultural Heritage domain, because of some features that make it attractive for our purposes. The attached guide (Appendix 3) explains the basics of X3D and illustrates an application.

Profiles in X3D. These are the new X3D way of defining both extensibility and the set of services that user's content requires. Therefore they appear potentially very important in the definition of an "EPOCH profile" for 3D heritage objects, hopefully to become a "Cultural Heritage profile" widely accepted in the heritage community.
In X3D, a **component** defines a specific collections of nodes. Typically that collection has a common set of functionality. A component consists of the node definition and a set of levels that provide increasingly greater set of implementation requirements. A low level requires only a few nodes and maybe a selection of the fields to be supported, while high levels require all of the lower level nodes, plus more complex nodes and support requirements.
A **profile** is a collection of components at specific levels of support. A profile may not contain another profile, though it may require all of the same components and level combos as another profile, plus more. All X3D files require the definition of a profile that is in use, which may be supplemented with the user requesting additional components - either at higher levels than those provided by the profile, or that are not already defined in the profile.
A profile can add other areas of functionality, such as a new scripting language support, or user-interface requirements, etc. Components can be in terms of entire functional areas.
The X3D system envisages also a reliable way of extending the core.
Interested parties can create new Components and submit them to the X3D Board for approval. When a component is submitted, it contains a prefix for the company submitting the component, similar to how OpenGL extensions have a prefix for the company which created the extension. Components will undergo testing and review by the X3D board, the Web3D

Consortium, and the community at large. Once a component is accepted and implemented by more than one company, the prefix changes to EXT_. If the component is ratified by the board, it then gets the prefix X3D_.
Finally, the X3D Board can deem that certain components are so widely adopted and important that they should be included in a set of modifications to the official ISO specification. Once a group of components and/or profiles are deemed important for inclusion across many applications, a new version of X3D can be created which includes, by default, a set of profiles. A new version implies more functionality than a lower version number.
Companies can create X3D browsers, tools, importers, and exporters which support different versions, profiles, and components. They do not need to support all existing components, but only those that suit their needs. By having profiles, their products can be sure that content they read will work in their application, and that content that they create will work in other applications that support their components or profiles.
The process of having components adopted into the X3D specification provides the mechanism to keep X3D-compliant applications working together. Many new features will fall under existing components, thereby introducing new levels for those components. By having companies be able to develop components and submit them, X3D leverages industry-wide advances quickly and efficiently. It also guarantees that X3D grows and flourishes, and does not become technically obsolete as prior standards have become.
On the other hand, componentization provides some benefits as the following:

- Small, lightweight core - It is easier for developers to implement X3D, reduce the complexity of the implementation, and hence improve the maintainability of this implementation.
- Extensibility - Through the notion of extensions and profiles, it is possible to build added functionality on top of the Core. This enables new features to be easily added, or existing features to be replaced with alternative extensions.
- Vertical market focus - An extensible architecture allows new specifications or profiles to be implemented on top of the Core browser. For example, there are working groups specifically devoted to extending X3D to suit specific vertical markets such as CAD-DCC chain and Medical VR and Visual Simulation.
- Reduced footprint - This is useful, for example, in the space of set-top boxes where each feature has a cost. Here, the ability to use profiles to enable a browser with a smaller footprint (and corresponding smaller set of functionality) is an absolute requirement particularly if one can add the appropriate profile (think of a box in a museum).

The issue concerning the development of an “EPOCH / Cultural Heritage Profile” needs to be further discussed and verified.

c) **COLLADA**. COLLADA ("COLLAborative Design Activity") is an open standard for the interactive entertainment industry that defines an XML-based schema for 3D authoring applications to freely exchange digital assets without loss of information. This enables multiple software packages to be combined into extremely powerful tool chains. COLLADA support programmable shaders authored and packaged using OpenGL ES Shading Language so that leading 3D authoring tools can work effectively together to create OpenGL ES applications and assets. Originally created by Sony, COLLADA is now supported by a vast community of developers. Technically speaking, COLLADA is not an international standard, but it is ncreasingly candidating as a de-facto industry standard. Exporting to this format from major 3D packages (3DStudio, Maya, Blender and others) is currently available.

An analysis of the advantages and disadvantages of adopting COLLADA has been carried out by Sven Havemann of Graz University, and is enclosed as Appendix 4.
Starting from here, a debate has opened (involving some 20 EPOCH researchers) on a Wiki managed at Leuven, taking into account several aspects of the choice, including features of COLLADA.
In brief, the comparison between COLLADA and X3D (one of the issues examined by the group) gives an advantage to both standards for the use of XML, guaranteeing long-term sustainability, under some regards each one has some features that the other has not, possibly balancing the judgement (see http://realism.com/Web3D/Collada/Nodes.html for a detailed comparison of nodes and their properties in both). No decision has been taken on the matter as yet.

Work is now addressing issues related to the use of such standards for Cultural Heritage. In particular, it is being investigated which features a typical object should have to fit with the peculiar needs of the domain, which is the relation between 3D objects and cultural objects, as envisaged for instance by CIDOC-CRM, and how the use of such objects (e.g. for communication) may influence the technological requirements.

In conclusion, the Network's on technological standards is mainly concerned with two aspects:
- Disseminating standards use among non-technical users, by providing introductory guidelines for the most relevant ones
- Focusing on the assessment of requirements for 3D objects to be used in the heritage domain.

4. Reliability of 3D cultural heritage models

The issue of reliability of 3D visualizations in the Cultural Heritage domain has been debated since the beginning of the use of computer graphics in this field. There is an extensive literature concerning the issue, in general advocating the need of a "philological" approach to interpretation, including options for alternate hypotheses, annotation and justifications of choices made. Although reconstructions are the outcome of interdisciplinary teams, and are usually released with the approval of archaeological experts, documenting the assumptions underlying the interpretation is usually neglected. This facilitates the prevalence of aesthetical, or, worse, spectacular, aspects over cultural ones. Computer models convey a sense of credibility and photorealism that sometimes is not based on true reliability. This contrasts with the principles of interpretation as stated in the Ename Charter:

> 2.1 Interpretation should be based on a well-researched, multidisciplinary study of the site and its surroundings, but should acknowledge that meaningful interpretation also necessarily includes conjecture, hypotheses, and philosophical reflection.
>
> 2.3 Visual reconstructions, whether by artists, conservation experts, or computer model, should be based upon detailed and systematic analysis of environmental, archaeological, architectural, and historical data, including analysis of building materials, structural engineering criteria, written, oral and iconographic sources, and photography. However, such visual renderings remain hypothetical images and should be identified as such.

Thus metadata acquire a particular importance in this context, and this reflects also on the previously mentioned discussion about technological standards and 3D cultural objects.

Documenting the reliability of such a model is a task that as yet cannot rely on an established methodology. It most probably requires investigating in detail the process of interpretation and reconstruction in the mind of the researcher before than in the computer, a process for which currently there is no documentation practice, let alone methodology. After the 2005 Pisa workshop, documentation methods from other disciplines were examined, but they produced no useful suggestion. For instance, documenting the industrial design process has been unsuccessfully attempted to conclude that filming designers at work was the only viable solution. Also in the archaeological domain, movies seem to be the most comprehensive documentation of investigation. It is famous the case of the Çatalhöyük site, where archaeologists are recorded while digging.
However, movies are unpractical and ineffective for our goals. They provide too much information to be useful to assess credibility, and need to be filtered to distillate relevant information and link it to what it pertains.
So the concept of "paradata" was suggested by the team of Richard Beacham at KCL and supported by PIN's team working on standards. Paradata is a term used to describe all the information concerning the process of collecting/processing information but not involving the information being collected/processed – in other words the *context* in which such information is collected/processed, *regardless of the outcomes* of collection/processing.
This concept is very useful to document the interpretation process. Not only such a process is currently not recorded, but probably also the interpreter (the archaeologist, or art/architecture historian) performs this activity intuitively, and unaware of all the steps leading him/her to a conclusion.

The principles guiding the use of 3-dimensional visualisation in the research and communication of cultural heritage are contained in a document, named the (Draft) **London Charter**, which is going to be widely circulated and discussed. In parallel, some test cases will be developed to analyze the behaviour of interpreters in these circumstances.
The London Charter has a great potential for wide adoption. It states the principles that should support and circumscribe 3D visualization in Cultural Heritage research and communication.
Its basic principles are:

- The acknowledgement of 3D visualization as a valid research and communication tool; it should not, however, be used when it is unnecessary or superfluous.
- The necessity of formally documenting the sources used to create the model.
- The necessity of transparency, i.e. access to data supporting credibility.
- The necessity of using standards in order to enable optimum inter- and intra-subject and domain interoperability and comparability.

It has been decided to start a large consultation on the draft version starting from the Florence EVA workshop. There is a Committee and a Secretariat managing the consultation process, which should end by September 2006 to launch the Charter at VAST2006 at the end of October in Cyprus.

The present draft version of the Charter is attached (Appendix 5) to the present report.

5. Usability and design

EPOCH is committed to study the usability of tools and to propose design guidelines. Usability is indeed an issue for heritage professionals, who are scared by technicalities and unfriendly interface. They rightfully complain that software often gives a deep technical background for

granted and this discourages or prevents a wide use . The results of the survey are included here from the executive summary of the report, while the full document is available in Appendix 6.

The report presents the results of two online surveys carried out to assess the practices of cultural heritage institutions (mainly European and North America) as far as the design and usability evaluation of interactive applications is concerned.

For the **Design Survey**, around 600 cultural heritage related institutions have been contacted (universities, research centers, museums, libraries, cultural heritage management centres) in a period comprised between June 2004 and December 2005. After two rounds of solicitation for filling out the online questionnaires, 27 responses were collected (for a response rate equal to 4,5%).

As to the practice in the design activity, some of the most salient results are the following:

- Applications are designed using "informal" methods and lightweight processes (favored over more formal approaches or workflow such as UML, which is not used or unknown to the majority of the sample), such as sketching, fast prototyping, iterative design, or others.
- Design specifications are mainly used as a communication tool with the clients and among the design team, but also to produce the "required" documentation for the project.
- Most of the institutions use graphics tools for documenting design ideas. However, a significant portion of the sample does not make use of any tool support.
- 25% of the characteristics of the final product is not traceable to the design specifications.
- The introduction of new design methods over the existing practice is perceived as useful especially if the new methods enable or facilitate the improvement of the usability of the final application.
- As to the introduction of novel design tools, they are expected to be beneficial mainly for better documenting design decisions.

For the **Usability Survey**, around 700 cultural heritage related institutions have been contacted (universities, research centers, museums, libraries, cultural heritage management centres, mostly shared with the previous sample) in a period comprised between June 2004 and December 2005. After two rounds of solicitation for filling out the online questionnaires, 48 responses were collected (for a response rate equal to 6,8%).

As to the practice in usability evaluation, some of the most salient results are the following:

- A significant part of the sample (25%) never carries out a usability assessment of their application using existing methods or techniques;
- Expert reviews, user observation and focus groups are the most used approaches to usability evaluation;
- 53% of the sample do not use any specific technique or method.
- The main target of the usability evaluation results are considered to be the designers and the project managers.
- 60% of the sample do not use any software tool in support of usability
- The design aspect where usability is perceived as most relevant is navigation;

- The introduction of new usability evaluation methods over the existing practice is perceived as useful especially if the new methods enable or facilitate the improvement of the usability of the final application and its overall quality.
- As to the introduction of novel usability tools, they are expected to be beneficial mainly for better documenting evaluation results (reporting usability evaluation findings).
- 20% of the sample does not know the W3C Web Accessibility Guidelines, and 30% of the sample feels as not up-to-date on current trends in accessibility practice.
- 60% of the sample never developed an application taking into account accessibility issues. However, 54% of them thinks to be going to develop applications considering these issues.

These initial results will be further elaborated to better understand the needs of the cultural heritage institutions as far as design and usability is concerned. Moreover, potential actions could be planned to introduce a more aware and reasoned usability and design practice in the cultural heritage domain (through workshops, coaching, mentoring, specific support to projects and sharing of state-of-the-art methodologies and practice drawn from other domains or from research advances).

6. Conclusions and future work

Although substantial results have been obtained, advancement in the field of standards is producing new questions and arising new issues. What is emerging is a clear picture of a need for standardization much stronger than stakeholders realize at first sight. Perhaps, the potential impact of activity on standards is often underestimated.

It happens frequently that people attending general presentations of EPOCH's activity contacts us after the lecture, requesting support and offering collaboration in this field. Among others, we may quote the following recent cases.

- INC, the **National Culture Institute of Peru**, a national body depending from the Ministry of Culture and in charge of "strategies and policies for the preservation, dissemination and research on National Cultural Heritage". During a conference where EPOCH presented all of its activities, and as usual documentation standards had just one slide over 30 for obvious time constraints, EPOCH representatives were contacted by the head of the INC World Heritage Office and requested to organize a course in Lima to INC officers on archaeological documentation standards. This preliminary contact has been formalized with a letter by the Director of INC. Plans for the course are ongoing.
- The **Oost Vlanderen** (BE) **Office for Museum Documentation** has contacted us to exchange ideas and experiences on their CIDOC-CRM-based museum inventory system.
- Authoritative members of **UK funding agencies** have stated that the London Charter may become a guideline for testing the quality of proposals submitted for evaluation to their committees.
- **IAA** (the Israeli national agency for antiquities), **ROB** (the Dutch national agency for archaeology) and **CIMEC** (the Romanian national office for heritage documentation), all EPOCH partners, are deeply involved in the Network's activity on documentation standards.

In conclusion, it is clearly appearing that ***work on standards is a very promising field for EPOCH's activity to have an impact on policies and policy makers***.

EPOCH will continue its activity on standards as planned. The goal is to arrive in year 3 to definitions of “EPOCH profiles” in each of the domains:

- In the documentation domain, the survey and the in-depth analysis of some national documentation procedures will clarify the possibility of a wide adoption of CIDOC-CRM compliant data models, together with tools (planned as part of activity 3.2) for mapping/conversion to such models of the currently used ones. This will lead to an extension/localization of CIDOC-CRM rightfully to be credited to EPOCH.
- In the technological domain, the analysis of the requirements of Cultural Heritage concerning 3D objects will lead to the definition of the features of an “EPOCH 3D object” candidate to become the “Cultural Heritage 3D object”.
- Principles for the correct use of visualization techniques in heritage will be stated in the London Charter, to be promoted as a set of universal criteria in this field.
- Usability and design issues will be further analysed, with the support of experts in related disciplines as media, communication and psychology.

Appendices

Appendix 1

Archaeological Italian Entities and their mapping to CIDOC-CRM

Authors: Giulia Marchese, Tommaso Zoppi
Date of document: 30th June 2005

Edited by Franco Niccolucci
PIN scrl

The reference model for cataloguing archaeological data in the Italian archaeological system have been published in 1984 by the *Istituto Centrale per il Catalogo e la Documentazione* (ICCD) of the Italian Ministry of Cultural Heritage. However, the present model considers only to the most important forms: Archaeological Sondage (SAS), Stratigraphical Unit (US), Archaeological Find (RA), Stratigraphical Surface Unit (USR), Anthropological Form (At), and Tomb (MA).
The development of the archaeological research and the continuous increase in computer applications to archaeology among the Italian academy, has often emphasized the need to create new catalogue entries or to update existing ones, in order to keep in line with modern developments of the archaeological research, particularly in the fields of landscape archaeology and the study of masonries. Common in the Italian universities excavations are the forms for the Site, Topographic Unit (UT), Stratigraphic Building Unit (USM), and forms for light recording of masonries (SAV).

The ICCD has already received the entries of SITO and USM (for cataloguing masonries) but still has to define their reference model.

The local use of excavation methodologies originating from various European experiences added new entries and systems of cataloguing. These systems, even though of limited use, represent an important node in the reflection on the archaeological documentation, placing the problem of the usability and data interrogation, and the problem of the interoperability with other systems.

In the perspective to create an XML-CIDOC compatible standard, applicable to mediate the heterogeneity of the Italian and European archaeological documentation, we first conducted a collection and analysis of the entries commonly employed in the Italian forms of US and USM, to complete them with other types of existing and widely used forms (SAS, RA, USR, etc). The database fields or the entries of the paper forms have been transformed in tags of entity or relation between entries (property), in tables already predisposed for the ontological tagging corresponding to CIDOC-CRM.

Mapping form

ENTITY-TAG	CONCEPT	CRM-ENTITY
AIE_00 Archaeological Italian Entity–tag	Identification of tag's base-concept	CRM-entity corresponding

FIELD PROPOSED BY	Indication of the public body that proposed the field

NOTES	Explanation of the meaning and the using of field

RELATION	WITH	NOTES
Name of the property to be used with the entity	Related entity	Explanation of the relation

DATE OF PROPOSAL	21/02/2005	MODIFICATION DATE	18/04/2006

Tables

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_01_SCHEDA_US>	US positive form	*E31_document*

FIELD PROPOSED BY	PIN-EPOCH

NOTES	Every unit in the excavation has a corresponding US form. The tag refers to the database report or, alternately, to the paper sheet defining the unit.

RELATION	WITH	NOTES
P70_documents	AIE_13_US	
P4_has_time_span	AIE_06_anno	
P70_documents	E5_event	Event: excavation

DATE OF PROPOSAL	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_02_CODICE_CATALOGO_GENERALE>	Catalogue code	*E75_conceptual_object_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	All the excavation documentation has to be hand over to the relevant Soprintendenza. Soprintendenza will assign a number of catalogue code also to US form. So the field does not have to be filled by the author of the form but by the appropriate officer of the Soprintendenza. Tag used in sounding form (SAS) and equal in the other documentation of the same sounding (US, USM, RA, USR).

RELATION	WITH	NOTES
P67_refers_to	AIE_01_SCHEDA_US	

DATE OF PROPOSAL	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_03_CODICE_CATALOGO_INTERNAZIONALE>	Catalogue code	*E75_conceptual_object_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	All the documentation of excavation has to be hand over to the appropriate Soprintendenza. Following the international agreement the Soprintendenza will assign a number of catalogue code also to US form. Tag used in forms: SAS, US, USM, RA, USR.

RELATION	WITH	NOTES
P67_refers_to	AIE_01_SCHEDA_US	

DATE OF PROPOSAL	22/02/2005	DATE OF MODIFICATION	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_04_SOPRINTENDENZA>	Local Soprintendenza of reference for the archaeological research	*E40_legal_body*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Every region has one or more authority body in charge to the protection of archaeological and architectonical heritage, called Soprintendenze. Tag used in forms: US, USM, RA.

RELATION	CON	NOTES
P50_is_current_keeper_of	AIE_05_SITO	Do we need extending the scope-note of P50 from Physical stuff to Persistent item, including also Appellation and Place appellation?

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_05_SITO>	Site of archaeological investigation	*E48_place_name*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The place where an archaeological investigation, excavation or survey took place, is indicated by the appellation of the place or by an alphanumeric code of identification. Tag used in forms: US, USM, RA.

RELATION	WITH	NOTES
P50_has_current_keeper	AIE_04_soprintendenza	
P88_consist_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_06_ANNO>	Year or years of archaeological investigation	*E52_time_span*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Year of the investigation. Tag used in forms: US, USM, RA.

RELATION	CON	NOTES

P4_is_time_span_of	AIE_01_SCHEDA_US	

PROPOSAL DATE	22/02/2005	**MODIFICATION DATE**	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_07_AREA>	Area	*E44_place_appellation*

FIELD PROPOSED BY	Università degli Studi di Firenze - Archeologia Medievale

NOTES	The excavation site is divided into areas of investigation or work, individuated by a number and/or a letter, and then mapped on site map. Tag used in forms: US, USM.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	**MODIFICATION DATE**	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_08_SAGGIO>	Sondage	*E44_place_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The site subdivisions can be various, the more common of these is the sondage. The sounding is identified by a number or a letter and his limits are drawn in the site map. Tag used in forms: US, USM,RA.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	**MODIFICATION DATE**	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_09_SETTORE>	Sector	*E44_place_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The site of excavation and the sondage are divided into sectors of work and investigation individuated by a number or a letter, and then mapping in the site map. The US unit founded has to be localized in the appropriate sector/s. Tag used in US forms.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	**MODIFICATION DATE**	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY

<AIE_10_AMBIENTE>	Space	*E44_place_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	When there are masonry structures, the excavation site or the sounding are divided into spaces, individuated by a number or a letter (an arabic progressive numbering is suggested), and then mapping in the site map. Tag used in forms: US, USM.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_11_QUADRATO>	Grid square	*E44_place_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The excavation site can be organized with an established grid square of area overlapped on planimetry. The square side hasn't standard measures but it depend on soil features. Every square is indicated by a square number. Tag used in US forms.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_12_QUOTE>	Reading level	*E47_spatial_coordinates*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The US's surface has to be documented by all the quote that one can considers useful. In many cases it will be sufficient to notes the maximum and the minimum reading level referring to the zero quote of sounding. Tag used in US forms.

RELATION	CON	NOTES
P55_is_current_location_of	AIE_13_US	

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_13_US>	Stratigraphic unit	*E_context*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	This is the number or the code of the positive US described in the form. Tag used in US forms.

RELATION	WITH	NOTES

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_14_FORMAZIONE>	Formation cause of unit	*E63_beginning_of_existence*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	In this field you have to indicate the cause, natural or artificial, that has produced the unit. Natural units are the ones in witch formation the nature has directly took part accumulating or taking away terrain. Like for example the river and eolic sedimentations, and the river and eolic erosions, but also the collapse caused by earthquake, by abandonment, by slope or by gravity, ecc. Artificial unit are the ones in witch formation the man has took place increasing or destroying, voluntarily or non voluntarily, the site stratiphication. Like for example the walls, the house floors, the defensive pits or the holes for growing , the exhausts ecc. The required definition not be connected with the components of the unit. The entry 'formation' wants a primarily judgement, restricted in this moment to the agent that has caused the formation of the unit in exam. Further clarification will be given by other fields. Tag used in US forms.

RELATION	WITH	NOTES
P92_brought_into_existance	AIE_13_US	

PROPOSAL DATE	23/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_15_PIANTE>	Map	*E31_document*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of map/s number where the Unit is present. Every unit has to be documented by one map at least. Tag used in forms: US, USM.

RELATION	WITH	NOTES
P70_documents	AIE_13_US	

PROPOSAL DATE	23/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_16_SEZIONI>	Section	*E31_document*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of section/s number where the unit is present. Tag used in forms: US,USM.

RELATION	WITH	NOTES
P70_documents	AIE_13_US	

PROPOSAL DATE	23/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_17_FOTOGRAFIE>	Photos	*E31_document*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of photo/s number where the unit is present. Tag used in forms: US,USM, RA.

RELATION	WITH	NOTES
P70_documents	AIE_13_US	

PROPOSAL DATE	23/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_18_TABELLA_MATERIALI>	Table of finds	*E31_document*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of tables numbers referring to finds collected in the stratigraphic unit of the form. The tables have a progressive numbering inside the sounding. Tag used in US forms.

RELATION	WITH	NOTES
P70_documents	AIE_24_COMPONENTI_ORGANICI	
P70_documents	AIE_25_COMPONENTI_INORGANICI	

PROPOSAL DATE	23/02/2005	MODIFICATION DATE	18/04/2006

*

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_19_CODICE_MATERIALI>	Finds code	*E73_information_object*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of general catalogue code of RA form if necessary filled for important finds. Tag used in forms: US, RA.

RELATION	WITH	NOTES
P67_refers_to	AIE_ra_form	RA is the form for archaeological objects, still to be defined

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

*

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_20_CODICE_MONETE>	Coin code	*E73_information_object*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indication of general catalogue code of Coin-form if necessary filled for important coins. Tag used in forms: US, RA.

RELATION	WITH	NOTES
P67_refers_to	AIE_coin_form	Coin form still under definition

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_21_DEFINIZIONE>	Definition and position of the unit	*E13_attribute assignment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The item ' definizione' demands to a global interpretation of the unit in exam, that depends on the specific function that it carries out in the stratification. The units more frequently found in the archaeological contexts are exemplified: there are positive units like the warehouses, the accumulates, the bringing back, the battered earth, the working levels, the fire zones, the fillings of ditches, the landslides of walls or covers, the foundations, etc. There are negative units like fractures, demolitions, cuts of walls and structures, openings of doors or windows, pole holes, holes for constructions, for refusals, for tombs, for fencings and defences. All the standing structures are masonry units, the foundations, the covers, the thresholds, the columns, the pillars, the suspensurae, the pavements in masonry, the hearths constructed, the reinforce structures, etc. It has to be moreover specified the position of the unit inside of the sondage, by geographic coordinates or by another system of reference. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P140_assigned_attribute_to	AIE_13_US	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_22_CRITERI_DISTINZIONE>	Distinction criteria	*E13_attribute assignment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	It indicates the criteria (variation of colour, consistency, composition, etc) used in order to distinguish the surface of the stratigraphical unit in exam from the other units, and all the motivations that have concurred to isolate the unit and to identify it. Tag used in forms: US, USM.

RELATION	WITH	NOTES
P140_assigned_attribute_to	AIE_13_US	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_23_MODO_FORMAZIONE>	Formation way	*E12_production_event*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	It has to be more specified the nature of the action of accumulation or of removal that has produced the unit in exam. Tag used in US forms.

RELATION	WITH	NOTES
P108_has_produced	AIE_13_US	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_24_COMPONENTI_ORGANICI>	Organic components of US	*E20_biological_object*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	For organic components we mean the fauna and vegetable remains that contribute to the formation of the layer. The identification of these elements does not constitute an instrument for determinate the deposition and the formation mechanisms of the layer. One has to search these mechanism in evidences of various types. For the organic rests moreover, you have to execute the normal analyses of laboratory, then attach them to US form. Tag used in US forms.

RELATION	WITH	NOTES
P46_forms_part_of	AIE_13_US	
P70_is_documented_in	AIE_18_TABELLA_MATERIALI	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_25_COMPONENTI_INORGANICI>	Inorganic components of US	*E19_physical_object*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	For inorganic components we intend as well as the primary geologic formations (bench of 'tufo', strained of washes, etc.) for which the single mineralogical determination is necessary, and the melted sediments constituted usually of detritus of cliffs and minerals in grains produced by the mechanical disintegration, and material post depositional like concretes, limestone and ferruginous, and modified rests or transport of structures and/or artefact for which it is necessary, beyond the eventual mineralogical determination, the granulometrical analysis. Tag used in US forms.

RELATION	WITH	NOTES
P46_forms_part_of	AIE_13_US	
P70_is_documented_in	AIE_18_TABELLA_MATERIALI	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_26_CONSISTENZA>	Consistency of the layer	*E26_physical_feature*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	This entry refers only to the stratigraphical units, constituted by soil and others components. The adjectives to use usually are: not coherent, friable, compact, hard, plastic, etc. Tag used in US forms.

RELATION	WITH	NOTES
P56_is_found_on	**E26_physical_stuff**	E26 is an empty tag referring to soil of layer. E26_physical_stuff P46_forms_part_of: E_context

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_27_COLORE>	Colour of layer	*E26_physical_feature*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	This entry only refers to the stratigraphical units constituted by soil and others components. It expresses the general tone of the colour of the unit in exam that can be sometimes different from the original of the earth (e.g. a layer rich of lime inclusion assumes a whitish tone, independently from the soil in which it is). It is suggested to measure the colours on the *Munsell Soil Colour Charts*, Baltimora 1975, with standard humidity. Tag used in US forms.

RELATION	WITH	NOTES
P56_is_found_on	**E26_physical_stuff**	E26 is an empty tag referring to soil of layer. E26_physical_stuff P46_forms_part_of: E_context

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_28_MISURE>	Measures	*E54_dimension*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	This field specifies the measures, if they aren't unknown by the attached graphical documentation. For the structures, even if they are graphically documented, you have to indicate the maximum length conserved in the sounding, the maximum and minimal height conserved, the thickness or the medium width, and the diameter if present; for the ditches and the trenches, you have to indicate the maximum length conserved, the maximum and minimal width conserved, the maximum and minimal depth, and the diameter if present. The measures have to be expressed in meters. Tag used in forms: US, USM.

RELATION	WITH	NOTES
P43_is_dimension_of	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_29_STATO_DI_CONSERVAZIONE>	Conservation state of unit	*E3_condition_state*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	It describes the state of conservation of all the structures and all the surfaces, also the cuts and/or the usury, found in the stratigraphy. For the layers, you have to signalize as well as the eventual modifications due to human action, regarding the original state (consisting in the shape, the position and the consistency), as the unit in exam has been altered from natural or mechanical agents (animals, roots, slopes, gravity, decomposition of organic matters), that can have determined movements of soil and materials. In absence of alterations the unit can be considered intact. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P44_condition_of	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_30_DESCRIZIONE>	Analytical description of the unit	*E13_attribute_assignment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The stratigraphical unit has to be accurately described. In the description of the US in particular you have to indicate: the structure of the ground; the post-depositional changes; the presence of concretions, incrustations and specks (dimensions, amount, colour); the configuration of the surface; the thickness and the variations of thickness; the morphologic character of the components; the type, the dimensions and the quantitative percentage of the artefacts present; the disposition of the components in the space; the nature and position of particular inclusions. For the USM you have to indicate: the orientation of the structure; the type and/or the constructive technique; the used building material, distinguishing in constituent and binder, and accurately described in particular; the system of putting in work; the working traces; the marks of quarry and factory; decorated elements of the surfaces. The foundations' description is like the standing structure one, with one additional annotation on the technique used (bag, open, mixed). For the surfaces of cut or of breach you have to indicate: the orientation; the general shape of the high contour with particular reference to the angles and the margins; the configuration of the profile of the walls and the type of detach between the surface of the wall and that one of the deep margin; the profile of the bottom; the slope of the walls. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P140_assigned_attribute_to	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_31_INTERPRETAZIONE>	Interpretation of unit	*E13_attribute_assignment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	The stratigraphical unit represents the result of an event or an action that you have to specify in his dynamic of formation. It is necessary therefore to interpret its function, the relationships with other stratigraphical units, both in spatial sense that in chronological; you have to follow the modifications of the unit in exam (in use or in function), from the moment of its formation to that one of the demolition and, eventually, of despoliation. Tag used in cards US, USM, USN.

RELATION	WITH	NOTES
P140_assigned_attribute_to	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_32_ELEMENTI_DATANTI>	Elements in the unit particularly important for dating	*E13_attribute_assignment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	You have to specify on which bases you can date in absolute and/or relative terms the unit in examination. In the case that you can do it by the analysis of the man made finds, you have to indicate only the latest ones presents. They constitute the term post of the formation of the unit in examination. You have also to specify the various nature of data that concurs to propose a more or less precise chronology, among the existing stratigraphical relationships inside of the sequence (e.g. a wall can be dated by the materials contained in its hole of foundation; the hole has like term post the dating of the materials of its filling, and like term ante that one of the materials of the first layers cut by the hole). For dating elements specific and particularly meant RA form is advised to you to use however one. Tag used in forms: US, USM.

RELATION	WITH	NOTES
P140_assigned_attribute_to	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_33_DATAZIONE>	Datation, period or phase of the unit	*E52_time_span*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	You have to indicate in absolute terms the dating of the unit in examination. In case that the stratigraphical sequence is widely articulated, you have to assign to the unit the period, or the phase of the entire stratigraphical sequence. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P4_is_time_span_of	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_34_DATI_QUANTITATIVI_REPERTI>	Total number of finds collected	*E78_collection*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	To indicate the total number of finds collected and catalogued into finds tables. The finds are divided by type and then by classes. Tag used in US forms.

RELATION	WITH	NOTES
P46_forms_part_of	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_35_CAMPIONATURE>	Taking out of samples	*E80_part_removal*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	This entry indicates the case if samples are been captured during the survey (earth, seeds, plaster, mortar, etc.). You have to indicate also the numbers identifying the withdrawals of samples and the numbers of attached documents eventually consisting in analyses of laboratory. Tag used in forms: US, USM.

RELATION	WITH	NOTES
P112_diminished	E19_physical_object	E80_part_removal P112_diminished: E19_physical_object (empty tag = campione). E19_physical_object (empty tag = campione) P46_forms_part_of: E_context

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_36_FLOTTAZIONE>	Screening method of soil	*E29_design_or_procedure*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	To indicate if there has been a whole soil flotation, or only partial. Tag used in US forms.

RELATION	WITH	NOTES
P67_refers_to	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_37_SETACCIATURA>	Screening method of soil	*E29_design_or_procedure*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Indicates if there has been a whole soil sifting, or only partial. Tag used in US forms.

RELATION	WITH	NOTES
P67_refers_to	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_38_AFFIDABILITA'_STRATIGRAFICA>	Valuation of layer reliability	*E14_condition_assessment*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	To value the reliability of the unit in examination. You have to mark the eventual transformations regarding the unit previously of digging, of whichever nature they were, and that can have compromise the reliability. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P34_concerned	AIE_13_US	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_39_DIRETTORE>	Director of excavation	*E82_actor_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Name of the director of the excavation. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P11_participated_in	E5_EVENT	E5_event (excavation) P108_has produced: AIE_01_SCHEDA_US
P49_is_former_or_current_keeper_of	AIE_01_SCHEDA_US AIE_41_SCHEDA_USM	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_40_RESPONSABILE>	Responsible of the writing	*E82_actor_appellation*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Name of the responsible of the forms writing and of the investigation about the unit. Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P11_participated_in	E7_activity	E7_activity (form compilation), P16 use specific object: AIE_01_SCHEDA_US
P49_is_former_or_current_keeper_of	AIE_01_SCHEDA_US AIE_41_SCHEDA_USM	

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_41_SCHEDA_USM>	Stratigraphical masonry unit form	*E31_document*

FIELD PROPOSED BY	PIN-EPOCH

NOTES	Every building unit recovered in the dig or in the survey has a correspondent USM form. The tag refers to the report of the database or in alternative to the paper card defining the specifics of the unit.

RELATION	WITH	NOTES
P70_documents	AIE_43_US	
P4_has_time_span	AIE_06_ANNO	
P70_documents	E5_EVENT	excavation

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_42_SIGLA>	Acronym	*E44_place_appellation*

FIELD PROPOSED BY	Università degli Studi di Firenze - Archeologia Medievale

NOTES	Site acronym Tag used in USM forms.

RELATION	WITH	NOTES
P67_refers_to	AIE_05_SITO	

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_43_USM>	Masonry unit	*E_context*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	In this entry you have to mark the number (or the acronym) of the unit described in the form. Tag used in USM forms.

RELATION	WITH	NOTES

PROPOSAL DATE	22/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_44_UT >	Topographical unit	*E46_section_definition*

FIELD PROPOSED BY	A. Ricci, *La documentazione scritta nella ricognizione archeologica sul territorio: un nuovo sistema di schedatura*, 'Archeologia Medievale' 1983, pp.495-506

NOTES	It refers to the Topographical unit in which the USM is present. Tag used in USM forms.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_45_CA>	Architectural complex	*E46_section_definition*

FIELD PROPOSED BY	G.P. Brogiolo, *Archeologia dell'edilizia storica*, Como 1988

NOTES	Reference to the architectonic Complex to which the USM belongs. Tag used in USM forms.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_46_CF >	Architectural unit	*E46_section_definition*

FIELD PROPOSED BY	G.P. Brogiolo, *Archeologia dell'edilizia storica*, Como 1988

NOTES	Reference to the architectural unit to which the USM belongs. Tag used in forms: USM, USN.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_47_PG>	General front elevation	*E46_section_definition*

FIELD PROPOSED BY	G.P. Brogiolo, *Archeologia dell'edilizia storica*, Como 1988

NOTES	Reference to the general front elevation to which the USM belongs. Tag used in forms: USM, USN.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_48_PP>	Particolar front elevation	*E46_section_definition*

FIELD PROPOSED BY	G.P. Brogiolo, *Archeologia dell'edilizia storica*, Como 1988

NOTES	Reference to the particolar front elevation to which the USM belongs. Tag used in forms: USM, USN.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_49_UF >	Functional unit	*E46_section_definition*

FIELD PROPOSED BY	G.P. Brogiolo, *Archeologia dell'edilizia storica*, Como 1988

NOTES	Reference to the Functional unit to which the USM belongs. Tag used in USM forms.

RELATION	WITH	NOTES
P58_defines_section	AIE_43_usm	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_50_COMPOSIZIONE>	Composition	*E24_physical_man_made_stuff*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the physical composition of the unit in examination. (e.g. stone with mortar; stone without mortar; bricks with mortar, earth; mixed, etc.) Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E_context	
P45_consist_of	AIE_55_litotipi	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_51_ZEPPE>	Galetting	*E19_physical_object*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the presence or the absence of galetting with constructive functions in the unit in exam. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E_context	
P43_has_dimension	AIE_52_percentuale_zeppe	
P56_bears_feature	AIE_61_caratteristiche_giunti_e_letti	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_52_PERCENTUALE_ZEPPE>	Percentage of galetting	*E54_dimension*

FIELD PROPOSED BY	Università degli Studi di Firenze – Archeologia Medievale

NOTES	It indicates the percentage of galettings with constructive functions presents in the unit compared with the others elements constituent of the unit in exam (approximate estimation). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	AIE_51_zeppe	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_53_RIVESTIMENTO>	Covering	*E19_physical_object*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It synthetically indicates the presence and the type of plastering of the unit in examination. If it is present, you have to specify the reference to the relative USR form. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_54_POSA_IN_OPERA>	Disposition of the elements	*E17_type_assignment*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the equipment of pieces (Disposition) used in the construction of the unit in exam (e.g. horizontal and parallels course; course sub-horizontals; irregular with horizontal course; without course; etc.) Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P41_classified	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_55_LITOTIPI>	Stone material	*E57_material*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp. 291-300

NOTES	It indicates the stone material used in the construction of the unit in exam. (e.g. sandstone; limestone; compact limestone; marble; dolomite, etc.) Masonry in stone. Tag used in USM forms.

RELATION	WITH	NOTES
P45_is_incorporated_in	AIE_50_composizione	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_56_LAVORAZIONE_DEI_PEZZI>	Stone finishing	*E25_man_made_feature*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the degree and the type of working of pieces used in the construction of the unit in exam. (e.g. split stone; river pebbles; roughly hewn; summary squared; perfectly squared; sawing; etc.) Masonry in stone. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_57_FINITURA_SUPERFICIALE>	Dressed face type	*E25_man_made_feature (E11_modification_event: P31_has_modified E22_man_made_object: P56_bears_feature E25_man_made_feature; E22_man_made_object P46_forms_part_of E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the type of surface finish of pieces used in the unit in exam (e.g. absent; smoothed; etc.). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E22_man_made_object	
E11_modification_event: P16_use_specific_object	AIE_58_strumento_di_finitura	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_58_STRUMENTO_DI_FINITURA>	Tools traces	*E22_man_made_object*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the tool used for the surface finish referring to the traces left on the examined pieces. (e.g. axe; hammer with tooth; saw; chisel; etc.) Tag used in USM forms.

RELATION	WITH	NOTES
P16_was_used_for	E11_modification_event	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_59_NASTRINO>	Moulding	*E22_man_made_object*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the presence of the moulding on the pieces of the unit in exam. Masonry in stone. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E_context	
P56_bears_feature	AIE_60_caratteristiche_nastrino	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_60_CARATTERISTICHE_NASTRINO>	Moulding features	*E25_man_made_feature*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the measure and the features of the moulding. The measures are usually expressed in centimetres. Masonry in stone. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	AIE_59_nastrino	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_61_CARATTERISTICHE_GIUNTI_E_LETTI>	Joint and bed features	*E25_man_made_feature (E22_man_made_object: P56_bears_feature E25_man_made_feature; E22_man_made_object P46_forms_part_of E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the characteristics of conservation of the joints and of the beds of the unit's pieces (e.g. washed; flowing back; smooths down; recorded; irregular; etc), and the shape and the disposition of the galettings inserted (e.g. slab galettings in the joints; polygonal galettings in the beds; etc.) Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E_context	
P56_is_found_on	AIE_51_zeppe	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_62_MIN_GIUNTI>	Minimum measure of joint	*E54_dimension (E22_man_made_object: P43_has_dimension E54_dimension)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the minimum measure of the joint of the unit. The measure are expressed in centimetres. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_63_MAX_GIUNTI>	Maximum measure of joint	*E54_dimension (E22_man_made_object: P43_has_dimension E54_dimension)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the maximum measure of the joint of the unit. The measure are expressed in centimetres. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_64_MIN_LETTI>	Minimum measure of bed	*E54_dimension (E22_man_made_object: P43_has_dimension E54_dimension)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the minimum measure of the bed of the unit. The measure are expressed in centimetres. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_65_MAX_LETTI>	Maximum measure of bed	*E54_dimension (E22_man_made_object: P43_has_dimension E54_dimension)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the maximum measure of the bed of the unit. The measure are expressed in centimetres. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_66_MODULO_5_CORSI>	5 courses module	*E54_dimension*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the measure of 5 course of the wall in examination. Measure are expressed in cm. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_67_COMPOSIZIONE_LEGANTE>	Bond composition	*E24_physical_man_made_stuff*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the composition of the mortar used in the construction of the wall unit in exam (e.g. mortar of lime and sand; earth and lime; earth; etc). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E22_man_made_object	E22 is an empty tag referring to bond (legante)
P56_bears_feature	AIE_68_consistenza	
P56_bears_feature	AIE_69_aderenza	
P56_bears_feature	AIE_70_colour	
P45_consist_of	AIE_71_aggregati/inclusi	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_68_CONSISTENZA>	Mortar compaction	*E26_physical_feature*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the characteristics of compactness or cohesion of the binder used in the construction of the wall in exam (e.g. sandy; tenacious; medium tenacious; much tenacious). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	AIE_67_composizione_legante	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_69_ADERENZA>	Mortar adherence	*E26_physical_feature*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the characteristics of adhesion of the binder to the constructive pieces of the wall in exam (e.g. insufficient; good; optimal). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	AIE_67_composizione_legante	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_70_COLORE>	Mortar colour	*E26_physical_feature*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the colour of the binder used in the unit in exam. Normally the colour is established by the comparison of all the mortars analyzed in the site during the investigation. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	AIE_67_composizione_legante	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_71_AGGREGATI/INCLUSI>	Mortar inclusions	*E57_material*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the inclusions found in the binder used in the unit in exam, by an autoptical examination or by analysis of laboratory (e.g. fluvial sand; little stones; tile; chamotte; gravel; coal; straw; etc). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P45_is_incorporated_in	AIE_67_composizione_legante	
P43_has_dimension	AIE_72_granulometria	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_72_GRANULOMETRIA>	Granulometry of the mortar inclusions	*E54_dimension*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the dimension of the inclusions found in the binder of the unit in examination, established by an autoptical examination or by analysis of laboratory (e.g. silt; sand; gravel). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	AIE_71_aggregati/inclusi	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_73_TIPO_NUCLEO>	Type of the wall nucleus	*E17_type_assignment (P41_classified E22_man_made_object-nucleo;P46_forms_part_of E_context)*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the type of nucleus of the unit in exam (e.g.; Concrete without covering; band prepared within external courses; band prepared in continuous courses; incoherent; etc.) Masonry in stone and brick. Tag used in USM forms. Bibliography: DOGLIONI F., PARENTI R., *Murature a sacco o murature a nucleo in calcestruzzo? Precisazioni preliminari desunte dall'osservazione di sezioni murarie*, "Scienza e Beni Culturali", 1993, IX, pp.137-156.

RELATION	WITH	NOTES
P41_classified	E22_man_made_object	E22 is an empty tag referring to "nucleus"

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_74_SPESSORE NUCLEO>	Nucleus thickness	*E54_dimension*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the thickness of the section of the wall. Measures are expressed in cm. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	E22 is an empty tag referring to "nucleus"

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_75_COMPOSIZIONE_LEGANTE_NUCLEO>	Composition of nucleus mortar	*E24_physical_man_made_stuff*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the composition of the binder used in the nucleus of the construction (e.g. mortar of lime and sand; earth and lime; earth; hydraulic lime; concrete; etc). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E22_man_made_object	E22 is an empty tag referring to "nucleus mortar"
P45_consist_of	AIE_76_aggregati_legante_nucleo	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_76_AGGREGATI_LEGANTE_NUCLEO>	Inclusions in the nucleus mortar	*E57_material*

FIELD PROPOSED BY	

NOTES	It indicates the presence of inclusions in the binder of the nucleus of the construction, found by an autoptical examination or by analysis of laboratory (e.g. fluvial sand; little stone; tile; chamotte; gravel; coal; straw; etc). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P45_is_incorporated_in	AIE_75_composizione_legante_nucleo	
P43_has_dimension	AIE_77_granulometria_legante_nucleo	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_77_GRANULOMETRIA_ LEGANTE_NUCELEO>	Granulometry of nucleus inclusions	*E54_dimension*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the dimension of the inclusions present in the binder of the nucleus, established by an autoptical examination or by analysis of laboratory (e.g. silt; sand; gravel). Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	AIE_76_aggregati_legante_nucleo	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_78_CONSISTENZA>	Brick compaction	*E26_physical_feature (P56_is_found_on: E22_man_made_object; E22_man_made_object P46_forms_part_of: E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the characteristics of compactness or solidity of bricks used in the construction of the wall in exam (e.g. sandy; compact; much tenacious). Masonry in tile. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E22_man_made_stuff	E22 is an empty tag referring to “bricks”

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_79_COTTURA>	Degree of brick baking	*E26_physical_feature (P56_is_found_on: E22_man_made_object; E22_man_made_object P46_forms_part_of: E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the baking of brick used in the construction of the unit in exam (e.g. raw; much baked; melted; fused). Masonry in brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E22_man_made_stuff	E22 is an empty tag referring to “bricks”

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_80_TEXTURA>	Brick texture	*E26_physical_feature (P56_is_found_on: E22_man_made_object; E22_man_made_object P46_forms_part_of: E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the characteristics of the surface (Texture) of the bricks used in the construction of the wall in exam (e.g. smooth; rough; knurled; etc.) Masonry in brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E22_man_made_stuff	E22 is an empty tag referring to “bricks”

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_81_INCLUSI>	Inclusions of the bricks	*E57_material*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the inclusions present in the bricks used in the construction of the wall in exam found by an autoptical examination or by analysis of laboratory (e.g. fluvial sand; pebble; gravel; coal; straw; etc). Masonry in brick. Tag used in USM forms.

RELATION	WITH	NOTES
P45_is_incorporated_in	E22_man_made_object	E22 is an empty tag referring to “bricks”

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_82_COLORE>	Bricks colour	*E26_physical_feature (P56_is_found_on: E22_man_made_object; E22_man_made_object P46_forms_part_of: E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the colour of the bricks used in the wall. Masonry in brick. Tag used in USM forms.

RELATION	WITH	NOTES
P56_is_found_on	E22_man_made_stuff	E22 is an empty tag referring to “bricks”

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_83_FABBRICAZIONE>	Brick manifacturing type	*E17_type_assignment (P41_classified E22_man_made_object-mattone; P46_forms_part_of E_context)*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the type of fabrication of bricks used in the construction of the wall in exam (e.g. shaped; patterned; moulded; wire drawing; etc). Masonry in brick. Tag used in USM forms.

RELATION	WITH	NOTES
P41_classified	E22_man_made_object	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_84_CAMPIONE_PANNELLO>	Trace of the wall face	*E31_document*

FIELD PROPOSED BY	Università degli Studi di Siena (?)

NOTES	It indicates the drawing in scale 1:1 of a panel portion of the unit. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P70_documents	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_85_CAMPIONE ANGOLATA>	Trace of the wall corner	*E31_document*

FIELD PROPOSED BY	

NOTES	It indicates the drawing in scale 1:1 of an angle portion of the unit. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P70_documents	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_86_TIPOLOGIA_TECNICA_COSTRUTTIVA>	Masonry technique type	*E17_type_assignment*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It indicates the attribution of the unit in exam to a type constructive based on the analysis of the used technique. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P41_classified	E_context	

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_87_FONDAZIONE>	Type and characteristics of the foundation	*E22_man_made_object*

FIELD PROPOSED BY	Università di Venezia

NOTES	It describes the type and the characteristics of the foundation, when visible, of the masonry analyzed. Tag used in USM forms.

RELATION	WITH	NOTES
P46_forms_part_of	E_context	

PROPOSAL DATE	02/03/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_88_DIMENSIONE_PIETRE_LATERIZI>	Dimensions of stones and bricks	*E54_dimension*

FIELD PROPOSED BY	Università di Genova - T. Mannoni, *L'analisi delle tecniche murarie medievali in Liguria*, in 'Atti del colloquio Internazionale di Archeologia Medievale', Palermo 1976, pp.291-300

NOTES	It refers to a table associated to the USM form in which there are the measures (height, length, depths) expressed in cm, of a big sample of constructive pieces, distinguishing between bricks and stones. Masonry in stone and brick. Tag used in USM forms.

RELATION	WITH	NOTES
P43_is_dimension_of	E22_man_made_object	E22 is an empty tag referring to "bricks" or "stones"

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_89_USN>	Negative stratigraphical unit	*E_context*

FIELD PROPOSED BY	PIN-EPOCH

NOTES	It is the stratigraphical unit number that refers to an action of cut, removal, erosion or destruction, natural or artificial. This stratigraphical unit has not a physical volume but it's intended only as an interface that marks an event.

RELATION	WITH	NOTES

PROPOSAL DATE	01/03/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_90_RIUSO>	Using of constructive pieces coming from other structures	*E9_move (P25_moved E22_man_made_object P26_moved_to E_context)*

FIELD PROPOSED BY	

NOTES	It indicates and it describes the constructive pieces presents in the masonry coming from other structures and from other historical periods. Tag used in USM forms.

RELATION	WITH	NOTES
P25_moved	E22_man_made_object	E22 is an empty tag referring to "bricks" or "stones"

PROPOSAL DATE	09/03/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_91_RESTAURO>	Presence of restoration	*E11_modification_event*

FIELD PROPOSED BY	

NOTES	It indicates and it describes the restorations presents in the masonry, carry out both in ancient age that in modern age. Tag used in USM forms.

RELATION	WITH	NOTES
P31_has_modified	E_context	

PROPOSAL DATE	09/03/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_92_DIAGRAMMA_STRATIGRAFICO>	Representation of the stratigraphic diagram	*E31_document*

FIELD PROPOSED BY	

NOTES	It indicates the reference to an image or a diagram of representation of the stratigraphic diagram, or partial one (relative to the unit in examination and its relationships), or entire one (relative to all the stratigraphy of the site). Tag used in forms: US, USM, USN.

RELATION	WITH	NOTES
P70_documents	E_context	

PROPOSAL DATE	05/05/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_93_fatto>	Stratigraphic units group	??

FIELD PROPOSED BY	Michel Py, *Lattara 10, Syslat 3.1 Système d'information archéologique, Manuel de référence*, Lattes 1997

NOTES	Atrophic grouping of stratigraphic units (Fr. *Fait*), also non contemporarily, identified by technique (part of the same vertical or horizontal structure, positive or negative) or function (different units that identify the same functional unit).

RELATION	WITH	NOTES

PROPOSAL DATE	09/03/2005	MODIFICATION DATE	18/04/2006

ENTITY-TAG	CONCEPT	CRM-ENTITY
<AIE_94_insieme>	US and Facts with the same function in a structure	??

FIELD PROPOSED BY	Michel Py, *Lattara 10, Syslat 3.1 Système d'information archéologique, Manuel de référence*, Lattes 1997

NOTES	A "set" (Fr. *Ensemble*) consists of a grouping of Facts and US originated by men's activity or natural sediments, with joint functions in time and space and same purpose. Having the same purpose does not exclude the possibility that constituting US were built in different periods, but they must have the same function in a structure in some same, circumscribed period. Belonging to the a set is neither exclusive not discriminating that a US or a Fact belong to a different Set (e.g. a wall dividing two different rooms; or the same wall belonging to different occupation phases each implying a different Set because the use was different). When defining a set one must be certain that components are physically contiguous, that they have in common the same function in a given period: e.g. walls of the same housing built in different periods but having in common the same function of "domestic use" in some period belong to the same set.

RELATION	WITH	NOTES

PROPOSAL DATE	26/03/2005	MODIFICATION DATE	18/04/2006

ARCHAEOLOGICAL PROPERTIES

Form

PROPERTY -TAG	CONCEPT	CRM-PROPERTY
AIP_00 Archaeological Italian Property – Tag's name	Identification of the tag's base concept	CRM correspondent property

FIELD PROPOSED BY	Indication of the agency that has proposed this specific field

NOTES	Meant and use explanation of the tag

DOMAIN	RANGE	NOTES
Entity- subject name	Entity-object name	Relationship explanation

PROPOSAL DATE	28/02/2005	MODIFICATION DATE	18/04/2006

Tables

PROPERTY -TAG	CONCEPT	CRM-PROPERTY
<AIP_12_ANTERIORE_A>	Before to (US, USM, USN)	*P120_occurs_before*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Chronological relationship with positive and/or negative stratigraphical unit. It refers to the USM, US, USN chronologically and immediately before to the unit in exam. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	**E_context**	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

PROPERTY -TAG	CONCEPT	CRM-PROPERTY
<AIP_13_POSTERIORE_A>	after to (US, USM, USN)	*P120_occurs_after*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Chronological relationship with positive and/or negative stratigraphical unit. It refers to the USM, US, USN chronologically and immediately after to the unit in exam. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	**E_context**	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

PROPERTY -TAG	CONCEPT	CRM-PROPERTY
<AIP_14_COEVO_A>	Contemporary to (US, USM, USN)	*P114_is_equal_in_time_to*

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Chronological relationship with positive and/or negative stratigraphical unit. It refers to the USM, US, USN chronologically and immediately contemporary to the unit in exam. Tag used in US, USM, USN forms

DOMAIN	RANGE	NOTES
E_context	**E_context**	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW CRM CLASSES AND PROPERTIES PROPOSALS FOR ARCHAEOLOGICAL DOCUMENTATION :

NEW AIE-CRM ENTITY	CONCEPT
<E_CONTEXT>	Archaeological context of excavation

FIELD PROPOSED BY	PIN scrl Prato-Università di Firenze

NOTES	
	Subclass of: E_italian_iccd_system **Superclass of**: **Scope Note**: This class include all the archaeological items both physical as conceptual. These items are defined into space and time, and they make activity or they are maked by activity. In this class we intend all the appellations for 'context': e.g. US, USM, USN, basket, level, layer, etc… Tag used in US, USM, USN forms This new class must be considered immediately below CRM entità in the hierarchy, but it may relate also with same level classes.

RELATION	WITH	NOTES
P70_is_documented_in	E31_document	
P55_has_current_location	E44_place_appellation	
P108_was_produced_by	E12_production_event	
P46_is_composed_of	E20_biological_object	
P46_is_composed_of	E19_physical_object	
P46_is_composed_of	E78_collection	
P45_is_composed_of	E24_physical_man_made_stuff	
P88_forms_part_of	E48_place_name	
P114_is_equal_in_time_to	E_context	
P120_occurs_before/after	E_context	
P4_has_time_span	E52_time_span	
P140_was_attributed_by	E13_attribute_assignment	
P56_bears_feature	E26_physical_feature	
P43_has_dimension	E54_dimension	
P44_has_condition	E3_condition_state	
P140_was_attributed_by	E13_attribute_assignment	
P67_is_referred_to_by	E29_design_or_procedure	
P34_was_assesed_by	E14_condition_assessment	
P41_was_classified_by	E17_type_assignment	
P129_is_about	E_italian_iccd_system	

PROPOSAL DATE	17/03/2005	MODIFICATION DATE	18/04/2006

NEW AIE-CRM ENTITY	CONCEPT
<E_italian_iccd_system>	Archival Methodology for archaeological data

FIELD PROPOSED BY	PIN scrl Prato-Università di Firenze

NOTES	**Subclass of**: E1 CRM Entity **Superclass of**: E_context **Scope Note**:

RELATION	WITH	NOTES
P129_is_subject_of	E_context	

PROPOSAL DATE	06/06/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT
<AIP_1_UGUALE_A> <P_is_equal_to>	Is equal to (context: US, USM, USN)

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Interpretative relationship of contexts. It refers to a stratigraphical unit that has the same features and the same time-span of an other unit. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_2_EQUIVALENTE > <P_has_same_intension>	Is equivalent to (context: US, USM, USN)	

FIELD PROPOSED BY	Michel Py, *Lattara 10, Syslat 3.1 Système d'information archéologique, Manuel de référence*, Lattes 1997

NOTES	Interpretative relationship of contexts. It refers to a stratigraphical unit that represents the same action, also if the unit is spatially and temporarily separated. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	5/05/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_3_LEGATO_A> <P_is_bonded_to>	Is bonded to (context: USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the positive stratigraphical unit in exam that is bonded to a positive unit. Tag used in USM form.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_4_APPOGGIATO_A> <P_batts_to>	Batts to (context: USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the positive stratigraphical unit in exam that batts to a positive unit. Tag used in USM form.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_5_GLI_SI_APPOGGIA> <P_is_batted_on_by>	Batted on (context: US, USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the positive stratigraphical unit that is batted on the unit in exam. Tag used in US, USM, forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_6_COPERTO_DA> <P_is_covered_by>	Is covered by (context: US, USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the unit that covers the unit in exam. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_7_COPRE> <P_covers>	Covers (context: US, USM, USN)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the positive unit in exam that covers a positive or negative stratigraphical unit. Tag used in US, USM forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_8_TAGLIA> <P_cuts>	Cuts (context: US, USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the negative stratigraphical unit in exam that cuts a positive unit. Tag used in USN form.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_9_TAGLIATO DA> <P_is_cut_by>	Cut by (context: USN)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the stratigraphical unit in exam cuts by a negative unit. Tag used in US, USM, USN forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_10_RIEMPIE> <P_fills>	Fills (context: USN)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the negative stratigraphical unit filled by the positive unit in exam. Tag used in US, USM forms.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	24/02/2005	MODIFICATION DATE	18/04/2006

NEW AIP-CRM PROPERTY	CONCEPT	
<AIP_11_RIEMPITA_DA> <P_is_filled_by>	Is filled by (context: US, USM)	

FIELD PROPOSED BY	ICCD - F. Parise Badoni, M. Ruggeri Giove (a cura di), *Norme per la redazione della scheda del saggio stratigrafico*, Roma, Multigrafica, 1984

NOTES	Physical relationship of contexts. It refers to the positive stratigraphical unit that fills the negative unit in exam. Tag used in USN form.

DOMAIN	RANGE	NOTES
E_context	E_context	Many to many

PROPOSAL DATE	01/03/2005	MODIFICATION DATE	18/04/2006

Appendix 2

Introduction to SVG

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Date of document: 30th March 2006

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What is svg

SVG (scalable vector graphics) is a language for describing two-dimensional graphics in XML. SVG allows for three types of graphic objects: vector graphic shapes (e.g., paths consisting of straight lines and curves), images and text. Graphical objects can be grouped, styled, transformed and composed into previously rendered objects. Text can be in any XML namespace suitable to the application, which enhances search ability and accessibility of the SVG graphics. The feature set includes nested transformations, clipping paths, alpha masks, filter effects, template objects and extensibility.
SVG drawings can be dynamic and interactive. The Document Object Model (DOM) for SVG, which includes the full XML DOM, allows for straightforward and efficient vector graphics animation via scripting. A rich set of event handlers such as onmouseover and onclick can be assigned to any SVG graphical object. Because of its compatibility and leveraging of other Web standards, features like scripting can be done on SVG elements and other XML elements from different namespaces simultaneously within the same Web page.
Mapping represents a perfect implementation of SVG, where a map is by nature a vector-layered representation of the earth. Naturally, the SVG specification allows the same layering concepts that are so crucial to any geographic information systems (GIS). Since maps corresponds to graphics that relates to our environment, there is a high need for maps to be informative and interactive. SVG allows to provide this interaction with very high quality output capability, directly on the web. Because of the complexity of geographic data (projections, coordinate systems, complex objects, etc.), SVG should not be viewed as the perfect replacement for common GIS formats, all of a sudden. SVG should rather be pictured as a new way to present quality geographic information to any user on the web, potentially using scalable vector maps on the client.

Benefits and present roadmap.
SVG offers a number of important advantages over bitmap or raster formats such as GIF and JPEG, especially when it comes to displaying drawn or mapping graphics. The advantages include:

- Zooming. Users can magnify their view of an image without sacrificing sharpness, detail, or clarity.
- Text stays text. Text in SVG images remains editable and searchable. There are no font limitations and users will always see the image the same way you do.
- Small file size. SVG files are, on average, smaller than other web-graphic formats such as JPEG and GIF and are quick to download.
- Display Independence. SVG images are always crisp on screen and print out at the resolution of your printer, whether it's 300 dpi, 600 dpi, or higher. You will never experience ugly, "jaggy" bitmaps.
- Superior color control. SVG offers a palette of 16 million colors, support for ICC color profiles, sRGB, gradients, and masking.
- Interactivity and intelligence. Since SVG is XML-based, it offers unparalleled dynamic interactivity. SVG images can respond to user actions with highlighting, tool tips, special effects, animation, and even real-time changes to surrounding HTML text.

Towards other vectorial format (es swf flash) there are obvious advantage: Svg is human readable, is an open standard, is written in xml and many browser are including an svg viewer in their new release

The following table (http://www.w3.org/Graphics/SVG/Roadmap) lists the publication dates (past or *expected*) for all of the SVG documents. The predicted dates are intended to be indicative only.

Document	FWD	*Next WD*	LC	CR	PR	REC
SVG 1.0	11 Feb 1999	-	03 Mar 2000	02 Aug 2000	19 July 2001	5 Sep 2001
SVG 1.1	30 Oct 2001	-	15 Feb 2002	30 Apr 2002	15 Nov 2002	14 Jan 2003
SVG Mobile Profiles	30 Oct 2001	-	15 Feb 2002	30 Apr 2002	15 Nov 2002	14 Jan 2003
SVG Mobile1.2	9 Dec 2003	-	13 April 2005	[Aug 2005]	[Jan 2006]	[Mar 2006]
SVG 1.2	11 Nov 2002	-	[Aug 2005]	[Oct 2005]	[May 2006]	[July 2006]
DOM Level 3 Events	01 Sep 2000	-	31 Mar 2003	[Dec 2004]	[Mar 2005]	[May 2005]
DOM Level 3 XPath	18 Jun 2001	-	28 Mar 2002	31 Mar 2003	[Mar 2005]	[May 2005]
sXBL	01 Sep 2004	05 Apr 2005	[Aug 2005]	[Oct 2005]	[Mar 2006]	[May 2006]
SVG Print	15 July 2003	[Jun 2005]	[Sep 2005]	[Nov 2005]	[Apr 2006]	[Jun 2006]
Authoring Tool Guidelines	[Aug 2005]	-	-	-	-	-
Accessibility Techniques	[Sep 2005]	-	-	-	-	-

Legenda: [Feb 2005] = expected date. FWD = First working draft; LC = last call for comments; CR = Candidate Recommendation; PR = Proposed Recommendation; REC = W3C Recommendation.

Main Features

Mapping represents a perfect implementation of SVG, where a map is by nature a vector-layered representation of the earth. Naturally, the SVG specification allows the same layering concepts that are so crucial to any geographic information systems (GIS). Since maps corresponds to graphics that relates to our environment, there is a high need for maps to be informative and interactive. SVG allows to provide this interaction with very high quality output capability, directly on the web. Because of the complexity of geographic data (projections, coordinate systems, complex objects, etc.), SVG should not be viewed as the perfect replacement for common GIS formats, all of a sudden. SVG should rather be pictured as a new way to present quality geographic information to any user on the web, potentially using scalable vector maps on the client. Usually now are used web-gis systems that use to send picture (jpg gif ..) to a client and the interactivity is realized with JavaScript now svg gives the possibility to use a pure vector format to view geographic information through the web

The skeleton of every svg file is the one shown below:

```
 <?xml version="1.0" encoding="ISO-8859-1" standalone="no"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 20010904//EN"
    "http://www.w3.org/TR/2001/REC-SVG-20010904/DTD/svg10.dtd">
<svg xmlns="http://www.w3.org/2000/svg"
     xmlns:xlink="http://www.w3.org/1999/xlink">
    <!-- SVG content goes here -->
</svg>
```

Coordinate unit

SVG uses a Carthesian coordinate system, the outset of which is located in the upper left corner of the drawing level. When using SVG for map representation, the y-axis needs to be inverted. As coordinate unit all the current ones may be used, such as px, pt, mm, cm, in, etc

Transformation

SVG allows different transformations: translation, rotation, scaling and skewing. The different transformations can be combined and nested. The matrix transformation is able to describe several transformations in one step, by using a 3x3 matrix from which actually only 6 values are used.

- translate(x, y): Move the points in the object by (x, y).
- scale(sx, sy) : Scale the points along the x and y axis. If sy is not used then both x and y axis are scaled by sx
- rotate(angle, cx, cy) Rotate the points around the point (cx, cy). This point is an offset of the current view box. If cx and cy are not present then the points are rotated around the origin.
- skewX(angle) : Skew along the x-axis.
- skewY(angle) : Skew along the y-axis.
- matrix(a, b, c, d, e, f) : This directly multiplies a transformation matrix against the current transformation matrix. The other functions are much easier to understand and much easier to maintain and manipulate.

It is very important to allow GIS users to transform data from a coordinate system to another one. In SVG it is possible to have all the feature in base coordinates and use the matrix to transform them in the real coordinate system in order to have all feature lighter
If the base coordinates are x=500000 y=600000, using a simple transformation like:

```
<g transform='translate(500000,600000)'>
```

Every graphical feature will have 8 digit less and the file will be lightweight
So a rectangle

```
<rect x="500004" y="600005" width="40" height="40" fill="red"/>
```

will become the rectangle

```
<rect x="4" y="5" width="40" height="40" fill="red"/>
```

(of course for a rectangle the advantage is not so evident but in the case of many polylines the total size of the svg file can be drastically reduced).

Geometry

SVG defines 5 basic shapes. These shapes all have attributes specific to that shape for positioning and sizing. They also each have presentation attributes which effect things like fill and stroke color, border width and more. Basic shapes (and complex shapes) have many common presentation attributes.
It is possible to define:

- The 'rect' Element:

  ```
  <rect x="20" y="20" rx="0" ry="0" width="160" height="160" fill="blue" />
  ```

  where x is the x-axis top-left corner of the rectangle, y is the y-axis top-left corner of the rectangle
  Rx is used in case of rounded rectangles. x-axis radius used to round the element (0 default),
  Ry is used in case of rounded rectangles. y-axis radius used to round the element (0 default)
  width is the width of the rectangle

height is the height of the rectangle

- The 'circle' Element:

```
<circle cx="100" cy="100" r="90" fill="blue" />
```

where (cx,cy) is the center of the circe and r is the radius

- The 'ellipse' Element

```
<ellipse cx="100" cy="100" rx="90" ry="80" fill="blue" />
```

where (cx,cy) is the centre of the ellipse, rx isthe length of the ellipse's radius along the x-axis and
ry is the length of the ellipse's radius along the y-axis

- The 'line' Element

```
<line x1="10" y1="10" x2="190" y2="190" stroke="blue" stroke-width="4" />
```

where (x1, y1) is the start point of the line and (x2, y2) is the end point of the line

- The 'polyline' Element

```
<polyline points="10,190 20,190 20,150 50,150 50,190 80,190 80,110
110,110 110,190 140,190 140,70 170,70 170,190 190,190" stroke="blue"
fill="darkblue" stroke-width="4" />
```

where points are the points of the polyline

- The 'polygon' Element

```
<polygon points="100,10 40,180 190,60 10,60 160,180 100,10" stroke="blue"
fill="darkblue" stroke-width="4" fill-rule="nonzero" />
```

where points are the points of the polygon

- <path>

The path element is the single most useful tag for creating professional looking SVG documents and it's the most difficult tag to hand-code in SVG. It is quite hard to visualize anything but the most simple of paths.

```
<path d="M100,10 L100,10 40,180 190,60 10,60 160,180 z" stroke="blue"
fill="darkblue" stroke-width="4" />
```

The path is defined in the 'd' attribute of the 'path' tag by a string of white space separated commands and coordinates.
Path commands are case-sensitive. Uppercase command's points use absolute positioning and lowercase command's points are relative the last point. The one exception to this is the first point always using absolute positioning.
Commands in the path have the following syntax.
Line commands

- M (moveto): Moves the pen to a new location (x, y). No line is drawn. All path data must begin with a 'moveto' command.
- Line Commands
- L (lineto): Draws a line from the current point to the point (x,y).
- H (horizontal lineto): Draws a horizontal line from the current point to x.
- V (vertical lineto): Draws a vertical line from the current point to y.

Cubic Bezier Curve Commands

- C (curveto): Draw a cubic bezier curve to the point (x,y) where the points (x1,y1) and (x2,y2) are the start and end control points, respectively.
- S (smooth curveto): Draw a curve to the point (x,y) where the point (x2,y2) is the end control point and the start control point is the reflection of the last point's end control point.

Quadratic Bezier Curve Commands

- Q (Quadratic Bezier curveto): Draw a quadratic bezier between the last point and point (x,y) using the point (x1,y1) as the control point.
- T (smooth quadratic Bezier curveto): Draw a quadratic bezier between the last point and point (x,y) using the reflection of the last control point as the control point.

Elliptical Arc Curve Commands

- A (elliptical arc): Draws and arc from the current point to x, y. The actual scale factor and position of the arc needed to bridge the two points is computed by the SVG viewer.

End Path Commands

- z : closepath: Closes the path. A line is drawn from the last point to the first.

The 'Text' Element

```
<text x="0" y="13" fill="red" text-anchor="start">Text</text>
```

It is also possible to include images in 64 bit format (http://groups.yahoo.com/group/svg-developers/files/Image2Base64.zip)

Animation (smil 2.0)

The easiest way to animate something in SVG is using SMIL. This is yet another standard from W3C that SVG uses. SMIL (pronouced 'smile') stands for Synchronized Multimedia Integration Language. It is a highly adaptable animation langauge which is extended and adapted for SVG. Amongst others, the following animation variables can be determined: start time of animation (usually relative to an event), duration and end time of an animation, repetition, number of repetition, etc. Depending on object type, various parameters may be animated, such as: colour value, position, position along a path, rotation, scale, and many more. A time line metaphor (as for example th one used in Macromedia's Director authoring system) allows to establish so-called "key frames", which display pre-defined values at a given time. In the meantime, either discreet values are used (key frames only), or interpolation is applied. Interpolation options are: step-by-step, linear, or spline. You may enter "key time values". If you don't, between intervals linear interpolation is applied. A singular motion path instruction is implemented, allowing position animation along path elements, and even accepting a distance-from-path argument. The object can be aligned automatically to the path. Animations may be combined as you please (cumulatively or not), or inherited to other child elements.

Interaction

Basic interaction features of an SVG viewer are zooming, panning, return to original view, and a display print option. Adobe's viewer implemented an additional text search function, an anti aliasing switch option, a copy feature, and a source code viewer. Together with possible events,

simple key functions may be implemented, e.g. in order to access certain cartographical applications, such as distance and surface measurement.
Hyper links, as with HTML, may be used to refer to other files, or to other elements within an SVG document. You can also refer to pre-defined "view-elements".
In SVG, three event categories are at disposition: mouse events, keyboard events, and state change events (concerning display and SVG file loading state. Complex applications may be realised combining scripts and Java applets. By JavaScript, the developer is able to fully access SVG's and every browser feature's DOM.
Cartographical applications range from simple switching on and off of elements and layers, changing graphical attributes, reacting to mouse events, such as displaying object data when mouse-over, linked windows (combining various views, e.g. overview and main map), interactive moving, scaling and rotating elements (e.g. didactical puzzles), or small applications, such as a user option to digitize and to save the data on the server in view of further editing and storage. Finally, with the help of server CGI scripts, or Java applets, and/or Java servlets, data bases can be linked as well.

Metadata section

Metadata which is included with SVG content should be specified within 'metadata' elements. The contents of the 'metadata' should be elements from other XML namespaces, with these elements from these namespaces expressed in a manner conforming with the "Namespaces in XML" Recommendation Authors should provide a 'metadata' child element to the outermost 'svg' element within a stand-alone SVG document. The 'metadata' child element to an 'svg' element serves the purposes of identifying document-level metadata.
The DTD definitions of many of SVG's elements (particularly, container and text elements) place no restriction on the placement or number of the 'metadata' sub-elements. This flexibility is only present so that there will be a consistent content model for container elements, because some container elements in SVG allow for mixed content, and because the mixed content rules for XML do not permit the desired restrictions. Representations of future versions of the SVG language might use more expressive representations than DTDs which allow for more restrictive mixed content rules. It is strongly recommended that at most one 'metadata' element appear as a child of any particular element, and that this element appear before any other child elements (except possibly 'desc' or 'title' elements) or character data content. If metadata-processing user agents need to choose among multiple 'metadata' elements for processing it should choose the first one.

Editor/ authoring (sodipodi, inkscape)

- Sodipodi: http://www.sodipodi.com/
  Sodipodi is a general vector illustrating application for Linux/Unix and Windows. It uses W3C SVG as native file and in-memory image format and can do many neat things. It is still at version 0.34.
- Inkscape http://www.inkscape.org/
  Inkscape is an Open Source vector graphics editor, using the W3C standard Scalable Vector Graphics (SVG) file format. Supported SVG features include shapes, paths, text, markers, clones, alpha blending, transforms, gradients, patterns, and grouping.
- Amaya http://www.w3.org/Amaya/
  Amaya is an open source Web editor project hosted by W3C supports a subset of the Scalable Vector Graphics (SVG) format, namely basic shapes, text, images, and foreignObject (the latter is useful to include HTML fragments or MathML expressions in

drawings).Alpha transparency, transformations, and animations are supported and the SVG source can be inspected and manipulated at any time. The graphics are written in XML and may be mixed freely with HTML and MathML. It also has annotation capabilities. Editing new SVG graphics in Amaya is not yet possible but Amaya development team is working on it.

- Batik http://xmlgraphics.apache.org/batik/
  Batik is a Java(tm) technology based toolkit for applications or applets that want to use images in the Scalable Vector Graphics (SVG) format for various purposes, such as viewing, generation or manipulation

It must be noticed that Adobe software, such as Adobe Illustrator, can export data to SVG.

Web-Viewer

The most interesting feature of SVG is to view and use it with a standard web browser. As yet it was possible only with a plug-in (adobe, mozilla etc…) now a new future is opening, in fact both Firefox and Opera in their latest release (1.5 for Firefox and 8.5 for Opera) have included an SVG viewer so the plug-in is no more necessary. Although some features and characteristics have not yet been integrated in such browsers, a new route has been opened and the future of SVG as standard for web vector graphics seems to be achieved.
To date nothing can be said of the next release of Internet Explorer (7.0); rumors stateit will have native support for SVG, probably integrated with activeX. There are news also for Safari, which in nightly builds has SVG support.

How to use SVG to view GIS data (.shp to .svg static and dynamic)

There are two major ways to view GIS data in an SVG environment:

1. Export a feature in SVG format.
2. Export gis feature in a spatially-enabled DB or in an XML-based DB

To export a GIS feature in SVG format there is a lot of plug-in for the various GIS software, for example for Mapinfo professional there are

1. Mi2svg (http://www.gisnet.com/notebook/SVG_mapping.htm) a basic free translator for mapinfo layer
2. Map2svg (http://www.gis-news.de/svg/map2svg.htm) Basic layer export with basic interaction with SVG

For Arcview there are:

1. ArcView Shapefile to SVG converter (shp2svg, ogis2svg.pl)
   (http://www.carto.net/papers/svg/utils/shp2svg/)
2. AnotherSimpleShapefile Converter
   (http://www.mycgiserver.com/~amri/converter.cocoon.xml)
3. GeoCon (http://www.mycgiserver.com/~amri/geocon.cocoon.xml)

For a dynamic use of svg there are many ways to create dynamically your svg file.

1) Mapserver (http://mapserver.gis.umn.edu/docs/howto/svg-howto)
   MapServer is an Open Source development environment for building spatially-enabled internet application, allows to create "geographic image maps", that is, maps that can direct users to content, from the version 3.5 it is possible to set-up the output format in order to render dynamically the map in SVG. The great advantage of this system is that, it is possible to keep all the geographic data in the original

format (esri mapinfo etc) and then decide how to render maps. Colours, visibility, text, layer order etc. can be set with a configuration file.
Of course the inconvenience is that is difficult to compare different gis data in different gis files so if you have for example information about the same area in different files you cannot compare them.

2) Php + Postgres + Postgis + assvg in this way the use of a geographic database Postgres + Postgis (http://postgis.refractions.net/) allows a full control of features and actions. The first step is to import all the GIS files in Postgis using for example quantum gis (http://qgis.org/) or jump (http://www.jump-project.org/), or using the postgis function shp2pgsql. Once the geometry is in the database, the way to view a selection of the feature is very simple because postgis has integrated a function of select assvg directly producing SVG output. A good tutorial on the use of the function assvg can be found at http://www.carto.net/papers/svg/postgis_geturl_xmlhttprequest/.

3) The third solution is a mix between the above two. It can be a good solution to use mapserver with postgis as repository for the map. In this way the power of Postgis for spatial queries may be combined with a GIS-oriented platform as Mapserver. For example php-mapscript has a number of functions ready for use: see http://techer.pascal.free.fr/postgis/tutorialphpmapscriptpostgis/index.html

The future of SVG

The future of SVG depends on its diffusion. In GIS environments there is a lot of research to find a “standard” way to communicate and share data. Besid the choice of Firefox and Opera to include in their new versions a native SVG viewer there are some important news:

1) Esri has decided to include support for the SVG data format on top of the upcoming ArcGIS 9.2 software platform.
2) The next version of Google Maps will use SVG for enabled browsers
3) In the mozilla community there is a very interesting project: Mozmapeditor: http://mozmapeditor.mozdev.org/ combines XBL/XUL/JS/RDF and SVG technology, and this application will be able to use WMS (and later WFS) Web Service to import any layer from GIS server like Geoserver. At present there is still no alpha version but the screenshot looks very promising
http://mozmapeditor.mozdev.org/screenshots.html

The future of SVG depends also on the new release of SVG as explained below.

SVG 1.2

The new draft, edited by Dean Jackson, specifies SVG version 1.2 as "a modularized language for describing two-dimensional vector and mixed vector/raster graphics in XML" and outlines areas of new work under discussion. Some new features include: Rendering Custom Components (RCC); Live Templates (an RCC alternative); dSVG reference (a UI toolkit); filter region extensions; SVGTimer interface (a replacement for setTimeout/Interval); better network data fetching support; Document Simple Model (scripting without the DOM); Tooltips; an experimental draft RelaxNG schema.

For mapping/GIS the most exciting feature (if it will be included in the final version) is the dSVG: Dynamic Scalable Vector Graphics (dSVG) The proposal is the most advanced user interface library that the SVG Working Group is examining; where the RCC model attempts to provide an extension mechanism for custom XML content, dSVG provides a set of predefined user interface elements, behaviors and controls."
The design goals of dSVG are:

- to minimize the amount of script a developer has to author, and if possible to allow a developer with no programming skill to create a Web application
- to minimize the application development time
- to make automatic generation of user interfaces as easy as possible
- to facilitate dynamic data mapping
- to perform better than scripting
- to not require scripting, especially on resource-limited devices
- to allow for expressions as attribute values

At its core, dSVG is an XML markup for user interfaces. It defines all the common user interface controls and enables those controls to be positioned and attached to particular actions. It is not tied to a form model, allowing an author to create a user interface that is not intended to capture data. It is possible that in final release of SVG 1.2 dSVG will be replaced by SVG's XML Binding Language (sXBL) but the general scope should be the same.

Mobile SVG

One of the most interesting feature of SVG could be the possibility of using it on mobile devices, but to allow it, it has been necessary to create light-profile SVG specifications. To address the range of different device families, two profiles are defined. The first low-level profile, SVG Tiny (SVGT) is suitable for low-end mobile devices; while the second profile, SVG Basic (SVGB) is targeted for higher level mobile devices.
Because of the reduced memory, low CPU power and limited display of mobile devices, Mobile SVG profiles introduce constraints on content, attribute types, properties, and user agent behavior. This section describes these constraints and the design rationale behind them.

1. Two profiles are designed to allow SVG to render on mobile devices with limited memory, CPU power, and bandwidth.
2. Mobile SVG profiles attempt to maximize compatibility with SVG 1.0 to display existing content.
3. A true subset of the SVG 1.0 imaging model is maintained.
4. Mobile SVG is designed to facilitate export from authoring tools.
5. Mobile SVG is designed so that SVG 1.1 can be transcoded into SVGB and SVGT preserving as much scalability as possible.
6. To ensure interoperability between content and software tools compliant with different profiles, SVGT is specified to be a proper subset of SVGB, and SVGB to be a proper subset of SVG 1.1.

Those SVG sub-profile geared offer very interesting features: 2D-vector drawing, raster-image embedding, animation, and definition of reusable assets like fonts and graphics objects.

Bibliography and interesting site/free software reporitories (in addition to links already quoted in the text.)

- http://www.w3.org/Graphics/SVG/ official site w3c
- http://www.w3.org/Consortium/Offices/Presentations/SVG/

- http://www.kevlindev.com/index.htm svg tutorial and example
- http://apike.ca/prog_svg_intro.html svg tutorial and example
- http://mozmapeditor.mozdev.org/screenshots.html
- http://www.w3.org/Graphics/SVG/About
- http://groups.yahoo.com/group/svg-developers/files/Image2Base64.zip software to transform images in 64 bit SVG files.
- http://xml.coverpages.org/ni2003-07-25-a.html preview of svg 1.2
- http://www-db.deis.unibo.it/courses/SI2/Relazioni/SVG.pdf introduction to svg (in Italian)
- http://www.xml.com/pub/a/2004/08/18/sacre.html mobile svg
- http://www.mozilla.org/projects/svg/ mozilla svg site
- http://xmlgraphics.apache.org/batik/ batik home page
- http://svg.org/ svg user community
- http://www.w3schools.com/svg/default.asp svg tutorial.
- http://www.carto.net/ svg paper, tutorial, project
- http://pilat.free.fr/english/ Pilat Informative Educative: SVG - PHP - MySQL - JavaScript

Appendix 3

Introduction to X3D

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X3D

X3D is an Open Standard XML-enabled 3D file format to enable real-time communication of 3D data across all applications and network applications. It has a rich set of features for use in engineering and scientific visualization, CAD and Architecture, Medical visualization, Training and simulation, multimedia, entertainment, educational, and more.
X3D is a considerably more mature and refined standard than its VRML predecessor so authors can achieve the behaviours they expect.
Which features of X3D distinguish it from VRML97? According to Tony Parisi, from Media Machines Inc., the most important new features are the following.

- Multiple data encodings (XML, VRML "classic", Binary)
- New graphics features (NURBs, Humanoid Animation, Multitexturing, Triangle primitives, 2D shapes inside 3D)
- New networking features (LoadSensor, improved Inline)
- Improved APIs, more language/object model bindings (e.g. DOM) and many clarifications to event model for better conformance
- Modularity (the standard is broken up into profiles and components so it can be supported at many levels)
- MPEG-4 has streaming interactive 3D using VRML

Another important goal was to create specification which would allow the widest possible interoperability; that the worlds created would render and behave identically in different implementations.

According to the Yumetech President, Alan Hudson, chair of the Web3D Open Source Working Group, the reasons are that

- We need XML to interoperate with the Web
- We need to incorporate new graphics technologies in a standardized way
- We need VRML content to run the same across browsers
- We need a standard which can evolve faster then every 5 years

It can be said that the requirement for a binary comes down to the application itself. A binary format is more compact and is necessary for an application like a real time world to be viewed through an Internet connection and for a very detailed scene. Alan Hudson suggests why one is necessary for X3D:

- Parsing Speed. I routinely process 20 to 30 MB VRML files. CAD users are pushing around 100+ MB. My desire is to push VRML into the simulation space where they routinely have databases representing the world or a very detailed region. I think a lack of binary format is a big issue. The combination of XML plus binary formats gives us both answers they need. But they must be 1:1 convertible, that's a key issue.
- Delivery Size. A big chunk of the VRML applications I've written have been local, so delivery size has not been that big of an issue. But I'd like to move the training applications I do to the a web delivery strategy. For an application I did 3 years ago the VRML file was 16 MB uncompressed, gzipped it's 3.5 MB. In my prototype binary work I've gotten it down to 1.5 MB binary gzipped. I've seen other work which has gotten the same type of file down to 300K with unpatented technology. At 300K it becomes feasible to deliver a full training application (this one involved 300 parts, 2 rooms, about 2.5 hours of training time). No streaming needed, just deliver the whole thing and run.

Work on the standard at the Web3D Consortium in partnership with ISO is ongoing. This relationship between ISO and the Web3D Consortium is one of the most successful and open of any involving ISO and a web standard. Richard Puk, the ISO/IEC JTC1/SC24 Liaison to the Web3D Consortium, says that
the ISO and the Web3D Consortium have had a mutually successful relationship since the publication of the first Web3D-originated standard, VRML 97 (ISO/IEC 14772). This relationship is based on a formal Cooperative Agreement that satisfies the requirements and responsibilities of both organizations while ensuring timely standardization of Web3D Consortium specifications. The two organizations are in the final stages of standardizing X3D, a second generation of three-dimensional functionality for the...Web.

ISO Name	Common Name	ISO Status	Date Last Updated
ISO/IEC 19775:2004	X3D Abstract	IS	Nov 2005
ISO/IEC 19775-1:2004/FPDAM Amd 1	X3D Amendment 1: Additional functionality	FPDAM	Nov 2005
ISO/IEC 19776:2005	X3D encodings: XML and Classic VRML	IS	Nov 2005
ISO/IEC FPDAM 19776-1:2005/Am1	X3D encodings: XML encoding: Amendment 1	FPDAM	Feb 2006
ISO/IEC FPDAM 19776-2:2005/Am1	X3D encodings: Classic VRML encoding: Amendment 1	FPDAM	Dec 2005
ISO/IEC CD 19776-3	X3D encodings: Binary encoding	CD	Dec 2004
ISO/IEC FDIS 19777-1:2005	X3D language bindings: ECMAScript	FDIS	Nov 2005
ISO/IEC FDIS 19777-2:2005	X3D language bindings: Java	FDIS	Nov 2005
ISO/IEC FDIS 19774	Humanoid Animation	FDIS	Nov 2005
ISO/IEC 14772:1997	Virtual Reality Modeling Language (VRML97)	IS	Dec 2003
ISO/IEC14772-1:1997/Amd. 1:2002	VRML97 Amendment 1	IS	Dec 2003

X3D Baseline Profiles

An X3D profile is a named collection of functionality and associated requirements that must be supported in order for an implementation to conform to that profile. Profiles are further defined as a set of components and corresponding support levels, as well as the minimum support criteria for all of the objects contained within that set. The X3D specification includes the following six profiles:

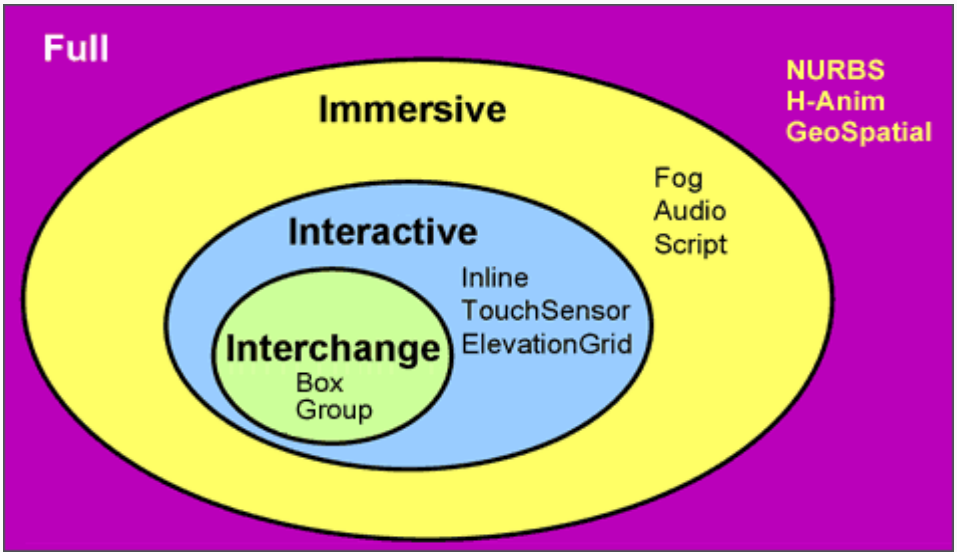
- **Core profile** defines the minimal file definitions and capabilities required by X3D
- **Interchange profile** is the basic profile for communicating between applications. It support geometry, texturing, basic lighting, and animation
- **Interactive profile**. enables basic interaction with a 3D environment by adding various sensor nodes for user navigation and interaction (e.g., PlanseSensor, TouchSensor, etc.), enhanced timing, and additional lighting (Spotlight, PointLight).
- **MPEG-4 interactive profile** defines a base point of interoperability with the MPEG-4 streaming media standard and supports lightweight devices
- **Immersive profile** enablse full 3D graphics and interaction, including audio support, collision, fog, and scripting.

- **Full profile** supports the complete set of X3D features and includes all defined nodes including NURBS, H-Anim and GeoSpatial components.

Vendors may also define their own profiles, if desired.

Definition of Core: a very compact nucleus that can be implemented quickly, without errors and with very small dimensions of the files. This includes the a small footprint (of the order also of the hundred of Kb), small plug-ins that can be easily included in a browser. This makes possible that X3D can be distributed just with a simple Java applet that works from as a viewer.

Extendibility. The core has the possibility of being extended with so-called profiles, that is a set of features specially designed for a vertical market.



X3D general features

In this chapter there is a description of a very simple X3D file in order to understand the principal node, and a complete description of all X3D nodes

```
1. <?xml version="1.0" encoding="UTF-8"?>
2. <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.0//EN"
   "http://www.web3d.org/specifications/x3d-3.0.dtd">
3. <X3D profile="Full">
4. <head>
                <meta name="filename" content="Test.x3d"/>
               <meta name="description" content="X3D example"/>
               <meta name="created" content="25 aprile 2004"/>
       </head>
5. <Scene>
6. <Transform>
7. <Shape>
      a. <Cylinder/>
      b. <Appearance>
            i.  <Material diffuseColor="1.0 0.4 0.0"/>
      c. </Appearance>
8. </Shape>
9. </Transform>
10.      </Scene>
11.      </X3D>
```

1-2 Header:

- Identification of supported standard (“X3D”)
- Identification of character code system (“UTF-8”)

3 Profile declaration
4 Metadata declaration (optional)
5-10 Declaration for the creation of the scene and the node-organization in the scene graph

6 Transform: create a local coordinate system to operate some geometric trasformation (rotation, translation, scale, center…)

7 Shape: create a figure composed by a geometric object and an appearance.

8 Cylinder: one of the geometric primitives (**Box Cone Cylinder Sphere Text**)

9 Material: definition of the surface property ex in that case the color specified as rwx values

When a user wishes to interact with an X3D scene graph through the use of custom code, either as a Script node as defined in 29 Scripting component of part 1 of ISO/IEC 19775 or from external applications, they may use the Scene Authoring Interface (SAI). This interface is a protocol for manipulating the X3D scene graph while not directly part of the scene graph itself. This specification is aimed at providing a language neutral representation of all actions that can be performed by an external application across this interface.. The SAI forms a common interface that can be used either for manipulating the browser and the scene graph from either an external application or from inside the scene graph through the Script node. However, it is not possible for code written for an external application to be immediately usable as a script. The two environments have quite different requirements and abilities to access and interact with the scene graph. This specification provides a single, unified programmatic interface and constraints that depend on the environment in which the code finds itself.

Conceptually, the SAI allows five types of access into the X3D scene:

- accessing the functionality of the Browser;
- receive notifications of the actions of the Browser, such as bad URLs, startup and shutdown;
- sending events to input-capable fields of nodes inside the scene;
- reading the last value sent from output-capable fields of nodes inside the scene; and
- getting notified when events change values of node fields inside the scene.

Editors

X3Dedit

X3D-Edit is a graphics file editor for Extensible 3D (X3D) that enables simple error-free editing, authoring and validation of X3D or VRML scene-graph files. Context-sensitive tooltips provide concise summaries of each VRML node and attribute. These tooltips simplify authoring and improve understanding for novice and expert users alike.
X3D-Edit uses the X3D 3.1 tagset defined by the X3D 3.1 Document Type Definition (DTD) in combination with Sun's Java, IBM's Xeena XML editor, and editor profile configuration files.

Xj3D

Xj3D is an open source Web3D Consortium project. It is a Java toolkit for VRML97 and X3D content and provides a browser that can handle VRML97 and X3D in both the XML-encoding and VRML Classic. Development of Xj3D has been financially supported by various institutes and companies. At this time xj3d is not 100% compliant with x3d specification but they are working to achieve that goal.

Translator plugins

- **Maya export plug-in**: ***RawKee*** (http://rawkee.sourceforge.net/) is an open source (LGPL) X3D plug-in designed for use with Alias' line of 3D authoring software, Maya Complete and Maya Unlimited. The purpose of RawKee is to export Maya's 3D data as an X3D file with support for scripting through RawKee's interaction editor. Develoment for RawKee is coordinated by the Archaeology Technologies Laboratory **(ATL)** of North Dakota State University **(NDSU)**. The ATL conducts research into the use of web-based 3D graphics for use in archaeology, historical, and human heritage preservation. The ATL is currently incorporating X3D into several of its projects. These projects include: Virtual Archaeologist, Digital Archive Network for Anthropology and World Heritage **(DANA-WH)**, and Native Dancer **(ND)**. There is a good example here:
  http://onaslant.ndsu.edu/x3d_content/imd.x3d

- **3dsmaxexporter** (http://darendash.home.comcast.net/MaxExporter.html) this is a first step export plug-in for 3d studio max it has to be considered a beta version.

- **Blender plug-in import and export**: Blender is the Open Source software for 3D modelling, animation, rendering, post-production, interactive creation and playback. Available for all major operating systems under the GNU General Public License so with those plug-in it is the first open source solution to create an X3D model

GIS environment

For the GIS environment GeoVRML (http://www.geovrml.org/1.1/) nodes (used before in VRML environment) have been added to the X3D specification as Geospatial Profile and a GeoVRML DTD has been produced for X3D. These are the nodes added to X3D

GeoCoordinate	- build geometry using geographic coords
GeoElevationGrid	- define height field in geographic coords
GeoInline	- inline with control of loading/unloading
GeoLocation	- georeference a VRML model
GeoLOD	- multi-resolution terrain level of detail
GeoMetadata	- information about the geographic data
GeoOrigin	- used to increase precision of coordinates
GeoPositionInterpolator	- animate objects with geographic coords
GeoTouchSensor	- query geometry for its geographic location
GeoViewpoint	- specify viewpoint in geographic coords

Features

The following list provides a high-level list of capabilities that are specifically addressed by GeoVRML 1.1.

1. **Spatial Reference Frames** - GeoVRML provides the ability to embed latitude/longitude or Univeral Transverse Mercator (UTM) coordinates directly into a VRML file, and have the browser transparently fuse these into a global context for visualization. GeoVRML 1.1 supports 3 spatial reference frames, 21 ellipsoids, and 1 geoid.
2. **Precision** - VRML97 provides only single-precision floating point values. This is insufficient to represent data on a planetary scale down to around 10 m resolution or beyond. GeoVRML provides solutions to extend this precision and enable sub-millimeter positional accuracies.
3. **Scalability** - GeoVRML provides various scalability features to manage the streaming of large, multi-resolution models over the web.
4. **Metadata** - GeoVRML provides the ability to specify a generic subset of metadata describing geographic objects, including the ability to link to a full metadata description.
5. **Animation** - The ability to interpolate within the supported spatial reference frames is provided so that animations can be defined with respect to key points on the surface of the planet.
6. **Introspection** - Functionality is provided to be able to query a GeoVRML scene and discover the geographic coordinate of any georeferenced point.
7. **Navigation** - GeoVRML 1.1 provides some basic support for navigation schemes that are specific to geographic applications. Specifically, the issue of elevation scaled velocity is addressed.

Gis to Vrml/GeoVRML

As explained above, the first task to allow GIS feature to be exported in the X3D environment is to transform the 3D feature in VRML or GeoVRML so the software is the same used for VRML technology. In the future it is expected that there will be some software directly exporting to X3D.

To export to VRML/GeoVRML there are several possibilities.

- DEM file: Starting from a DEM (Digital Elevation Model) the program: DEM2GeoEG (http://www.ai.sri.com/software/DEM2GeoEG) converts USGS DEM data into a VRML .wrl file that uses the GeoVRML 1.0 GeoElevationGrid. One benefit of this is that multiple GeoElevationGrids may be incorporated into a single scene and they will be correctly located with respect to each other.
  Otherwise, 3DEM (http://www.visualizationsoftware.com/3dem.html) can be used to produce three dimensional terrain scenes and fly-through animations from a wide variety of freely available data sources (DEM, DTM files and any topographic data file organized by rows and columns of elevation data).

- Esri: Starting from Esri software and having installed the ArcGis spatial analyst, 3D Analyst, a 3D model can be directly exported to GeoVRML.
  LandSerf (http://www.soi.city.ac.uk/~jwo/landserf/landserf220/index.html), a free available application, allows to import various vector formats and to export to a VRML file
  Shapeviz (http://www.my3d.com/ShapeViz.php) provides a simple way to quickly view GIS vector data,imported from ESRI Shape Format. It provides easy export capabilities to VRML and GeoVRML 1.0

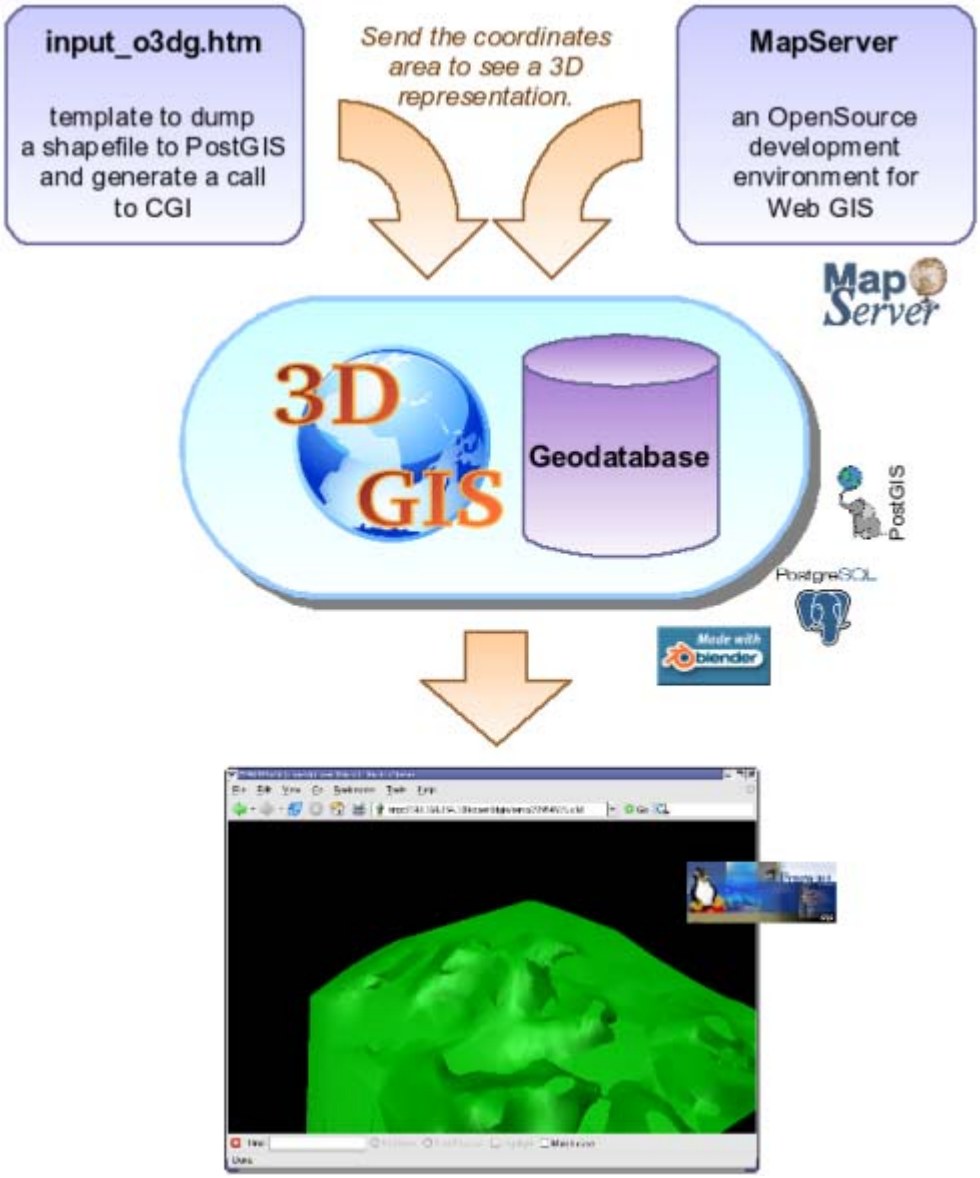
- Grass: (http://grass.itc.it/grass60/manuals/html60_user/p.out.vrml.html) the p.out.vrml module outputs GRASS data in VRML format.

- Mapinfo Qik_VRML is a VRML generator for Mapinfo. It is easy to use and is designed to generate simple 3D visualisation of Mapinfo maps and MIGs (http://www.directionsmag.com/files/index.php/view/297)

A useful software for improving the quality, performance and reliability of VRML worlds is Chisel (http://www2.hrp.no/vr/tools/chisel/install.htm).

There is a standalone package for translating a VRML97 file to X3D; it has been developed by NIST (National Institute of Standard and Technology): http://ovrt.nist.gov/v2_x3d.html

An optimal solution would be to have a Ge-database and a tool that allows the user to view 3D data in real time. An attempt in this direction is the project Open 3D GIS. This is an Open Source project with the main goal of providing a simple way to display 3D objects from a Geodatabase on the Web: http://www.open3dgis.org/. The package is still in a very early version (0.1). Below there is a diagram of this approach.


input_o3dg.htm
template to dump a shapefile to PostGIS and generate a call to CGI
Send the coordinates area to see a 3D representation.
MapServer
an OpenSource development environment for Web GIS
Map Server
3D GIS
Geodatabase
PostGIS
PostgreSQL
Made with blender

Viewers

The most common way to view an X3D model is to use a plug-in available over the web. The following table (http://cic.nist.gov/vrml/vbdetect.html) is a good summary of the situation even if a more updated situation can be viewed at the w3d site (http://www.web3d.org/applications/tools/viewers_and_browsers/)

Software	Type	OS			Browser		X3D
		Win	Linux	Mac	IE	Firefox	
Cosmo Player	P	X			X	X	
Cortona	P	X		X	X	X	
Octaga	P, S	X	X		X	X	X
BS Contact	P	X			X	X	X
Flux	P	X			X		X
Blaxxun Contact	P	X			X		
Venues	P	X			X		X
FreeWRL	P S		X	X		X	X
OpenVRML	P, S		X	X		X	
Xj3D	J, T	X	X	X			X
Carina	S	X	X	X			X
Orbisnap	S	X	X	X			
VRMLview	S	X	X				
Demotride	S	X					
BS Contact J*	J	X	X	X	X	X	
blaxxun3D	J	X	X	X	X	X	
Types: P-plugin, S-program, T-toolkit, J-Java							

most of this software comes from commercial software houses that however make the viewer available for free. The open source viewers are:

- **Xj3d** (http://www.xj3d.org/), developed directly by the X3D consortium
- **Freewrl** (http://freewrl.sourceforge.net/) an X3D VRML viewer that actually is developed only for Linux
- **Carina** (http://ariadne.iz.net/~entigo/carina/**)** a viewer focused around the xVRML file format, with some support for VRML97, X3D.

The future of X3D

The future needs of X3D can be summarized as follows:

- Need for higher level approaches on top of X3D
- Need for authoring tools
- Evolution of X3D for better authoring
- Improve performance for huge data models.
- Support for a double floating-point type for geospatial profile

Besides those points one of the more important step in the future is on how to combine different geo-datasets in one environment, and how to combine different data sets stored in federated DBMSs in one environment. Besides technical aspects (how to access data stored in separate DBMSs) also cartographic aspects (e.g. color) should be considered. This requires that not only spatial and non-spatial information of spatial objects are maintained in DBMS, but also characteristics such as physical properties of objects (texture, material, color), behavior (e.g. on-clickopen) and different Levels Of Detail representations.

Finally, there is an open discussion on the relation between X3D and SVG. In-fact although X3D was developed independently of SVG, the two technologies are complimentary for 3D and 2D graphics. Even if there are not any tools that support SVG for texturing surfaces in X3D, but the plan is to support that. Given that people have already written tools to display 3D using SVG or the canvas tag, it might even make sense to have a way to statically render X3D in an SVG file.
With the recent release of Firefox 1.5, SVG and the scriptable canvas tag have begun to enter the mainstream (both are built into Firefox and don't require plug-ins). Both WHATWG (Web Hypertext Application Technology Working Group) and Firefox developers have proposed extending the canvas tag to include a 3D context as well. Since Firefox is built on a cross-platform application toolkit (XULRunner), the possibilities for applications that leverage powerful 2D and 3D tools (along with all the other XML-based technology in that toolbox) get interesting quite fast.

Bibliography and references to interesting site/free software

- **Web3D Consortium site**
  http://www.web3d.org/
- **X3D tooltips**
  http://www.web3d.org/x3d/content/X3dTooltips.html
- **X3D sourcebook**
  http://www.web3d.org/x3d/content/examples/Vrml2.0Sourcebook/
- **France portal for 3D** (very complete, in French)
  http://www.web3d-fr.com/
- **Ibm 3D article**
  http://www-128.ibm.com/developerworks/xml/library/x-matters43/?ca=dgr-lnxw03VRML-X3D
- **Xml.com X3D articles**
  http://www.xml.com/pub/a/2003/08/06/x3d.html?page=1
- **X3DEDIT**
  http://www.web3d.org/x3d/content/X3D-EditAutoInstall/Web_Installers/install.htm
- **VRML to X3D NIST**

http://ovrt.nist.gov/v2_x3d.html

- **X3DEDIT manual**
  http://www.web3d.org/x3d/content/X3D-EditAuthoringTool.pdf
- **Realism X3D**
  http://realism.com/x3d/
- **Web3D 2006 Symposium**
  http://www.web3d2006.org/program.html
- **Sedris X3D introduction**
  http://www.sedris.org/stc/2001/pp/x3d/index.htm
- **Proceeding of the Tenth International Conference on 3D Web Technology, Web3D 2005, Bangor, UK, March 29 - April 1, 2005**
  http://www.informatik.uni-trier.de/~ley/db/conf/vrml/web3d2005.html
- **Workshop at the Web3D 2003 Symposium**
  http://www-mmt.inf.tu-dresden.de/web3d2003/

Appendix 4

Collada as an Interchange Format

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Date of document: 8th November 2005

1 Introduction

To combine the Epoch projects and strengthen the collaboration between the partner groups, a uniform application framework is important. Our group has promoted OpenSG as a suitable scene graph system capable of merging all of the projects into one great showcase. For data exchange purposes it is desirable to have a consistent 3D file format.
Concentrating on one format simplifies collaboration and the integration process.

1.1 Alternative formats

X3D

Like Collada, X3D is a XML-based scene format created by theWeb3D consortium [4]. X3D, standing for Extensible 3D Graphics, is the successor of VRML and is an official ISO standard. Because of the XML structure X3D is extensible and can be used as interchange format as well as Collada. The goal of X3D is to define a common 3D format mainly for web applications.

U3D

U3D is introduced by the 3D Industry Forum (3DIF) with Intel taking a leading role [1]. This file format also claims to be an open and extensible standard for sharing and visualization of 3D data in any mainstream application. U3D has been chosen by Adobe to be embedable into the pdf file format. U3D's main field of application is the efficient and memory saving streaming of 3D CAD data. As it is designed to be at the end of a production pipeline, U3D is not very suitable for data exchange in collaborative projects.

Other commercial formats

There are many other so called standard file formats which are capable of serving as an exchange format. But those formats, like for example "JT Open", "3D XML" and "dotXSI" are not open source and can therefore not be used freely.

2 Collada overview

Standing for COLLAborative Design Activity, Collada is a project that has the goal to design and define a 3D data format for lossless exchange between different applications [2]. It was launched 2004 as an open source project by Sony Computer Entertainment Inc. to assist their game development production pipeline. Collada is supported by major digital content creation (DCC) tool vendors such as Alias, Discreet and Softimage. As a real novum, all the DCC vendors work together on the format. One of the guidelines of Collada is to get rid of proprietary binary formats and use a well-specified XML based opensource format. Using standard XML code, Collada is fully extensible to all kinds of special needs. The Collada schema has been approved as an open standard by the Khronos Group [3].

2.1 Features of Collada 1.3.1

The COLLADA schema defines a core set of categorical elements that cover the problem domain of computer game development needs, focusing on graphics. The purpose of the categories is:

- To identify coarse sections of data to the processing tools, allowing them to quickly recognize data of interest;
- To provide a basis for future extensions, without introducing undue complexity and confusion to tools; (Adding new elements to one category will not affect a tool that processes data in a separate category.)
- To represent the distinct contributions from different participants in the content creation pipeline such as texture artist, modeler, animator, and level designer. The categories define a first level of document modularity within the schema.

2.1.1 Main categorical elements

scene

The scene embodies the entire set of information that can be visualized from the contents of a COLLADA resource. The hierarchical structure of the scene is organized into a scene graph.

material

The <material> element contains declarations of shaders, parameters, techniques, and vertex and pixel programs. The specific set of material parameters depend upon the graphics rendering system employed. Fixed, function, graphics pipelines require parameters to solve a predefined illumination model, such as Phong illumination. These parameters include terms for ambient, diffuse and specular reflectance, for example. The shader support in form of CG, HLSL and GLSL will be added to Collada in Version 1.4.

geometry

Geometry describes the visual shape and appearance of an object in the scene. For now objects can be described as lines, linestrips, polygons, triangles, trifans and tristrips. Primitves like "shpere" or "box" as in VRML are not supported by Collada. Free form surfaces like NURBS are planed to be added in later versions.

image

The <image> element best describes raster image data, but can conceivably handle other forms of imagery. Digital imagery comes in three main forms of data: raster, vector and hybrid. Raster imagery data is organized in Ndimensional arrays. Currently only raster bitmaps are supported. Image data can be included in the Collada file or stored externally and referenced by a filename.

texture

The <texture> element embodies the sampling aspects of texturing. Textures need three types of information:
1. Texel (<texture> element, after pixel) data that can contain values such as color, intensity, elevation (bump- or displacement-map), normals etc. This can be pre-authored as an image, or it can be procedurally generated (for example, a marble or wood texture).
2. Mapping information that determines how the image is placed on a 3-D object. This information is specific to the geometry that references a texture; therefore, it is stored on the

geometry. This allows for sharing textures between models while using different mapping on each. The types of mapping information are:

- Explicit texture coordinates (S and T) on vertices of primitives
- Method: planar (X-Y, Y-Z etc.), cylindrical, parametric (U-V), etc.
- Tiling (also called wrapping)

3. Blending information determines how the texel data will be interpreted. For example: the alpha channel of the image might be elevation used for bump mapping and the color (R, G, B) determines how reflective the surface point should be. Blending information is specific to the material and shader that uses a texture and is stored with the shader.

animation

An <animation> element contains the elements that describe animation data. Collada supports the functionality to store key frame animations and interpolation along a curve. More animation functionality will be added in Collada 1.4.

library

As data sets become larger and more complex they become harder to manipulate within a single container. One approach to manage this complexity is to divide the data into smaller pieces organized by some criteria. These modular pieces can then be stored in separate resources as libraries. The <library> element declares a module of elements of a single category like animation, camera, code, controller, geometry, image, light, material, program or texture.

2.1.2 Assets and extra data

The <asset> element defines asset management information like author, created, modified, revision, comments and some other regarding its parent element. There is one asset element per file. The <extra> element declares additional information regarding its parent element. This extra information can represent additional real data or semantic (meta) data to the application. Collada allows an <extra> element for geometry, node and scene.

2.1.3 Address Syntax

COLLADA uses two mechanisms to address elements and values within an instance document, as follows:

- The url and source attributes of many elements use the URI addressing scheme that locates instance documents and elements within them by their id attributes.
- The target attributes of the animation elements use a COLLADA defined addressing scheme of id and sid attributes to locate elements within an instance document. This can be appended with C/C++ style structure member selection syntax to address element values.

The id attributes are addressed using the URI fragment identifier notation. The XML specification defines the syntax for a URI fragment identifier within an XML document. The URI fragment identifier must conform to the XPointer syntax. As COLLADA only addresses unique identifiers with URI, the XPointer syntax used is called the shorthand pointer. A shorthand pointer is the value of the id attribute of an element in the instance document. In a url or source attribute, the URI fragment identifier is preceeded with the hash ("#") character.

In a target attribute there is no hash character as it is not a URI. For example the same <source> element is address as follows using each notation:

```
<source id="here" />
<input source="#here" />
<skin target="here" />
```

2.1.4 The use of <technique>

A technique conforms to a profile of information that describes the platform environment in which the technique is understood. The set of available profiles is outside the scope of this document, except for the COMMON Profile. Techniques act as a "'switch"'. If more than one is present for a particular portion of content, on import, one or the other is picked, but not both. Selection should be based on which profile the importing application can support.

Simple Collada example

In the following a short example of a COLLADA instance document is shown that describes a simple white cube.

```
<?xml version="1.0" encoding="utf-8"?>
<COLLADA xmlns="http://www.collada.org/2005/COLLADASchema" version="1.3.0">
      <library type="GEOMETRY">
            <geometry id="box" name="box">
               <mesh>
                  <source id="box-Pos">
                        <float_array id="box-Pos-array" count="24">
                              -0.5 0.5 0.5
                              0.5 0.5 0.5
                              -0.5 -0.5 0.5
                              0.5 -0.5 0.5
                              -0.5 0.5 -0.5
                              0.5 0.5 -0.5
                              -0.5 -0.5 -0.5
                              0.5 -0.5 -0.5
                        </float_array>
                        <technique profile="COMMON">
                              <accessor source="#box-Pos-array" count="8"
                              stride="3">
                                    <param name="X" type="float" />
                                    <param name="Y" type="float" />
                                    <param name="Z" type="float" />
                              </accessor>
                        </technique>
                  </source>
                  <vertices id="box-Vtx">
                        <input semantic="POSITION" source="#box-Pos"/>
                  </vertices>
                  <polygons count="6">
                        <input semantic="VERTEX" source="#box-Vtx" idx="0"/>
                        <p>0 2 3 1</p>
                        <p>0 1 5 4</p>
                        <p>6 7 3 2</p>
                        <p>0 4 6 2</p>
                        <p>3 7 5 1</p>
                        <p>5 7 6 4</p>
                  </polygons>
               </mesh>
            </geometry>
      </library>
            <scene id="DefaultScene">
            <node id="Box" name="Box">
                  <instance url="#box"/>
```

```
            </node>
      </scene>
</COLLADA>
```

2.2 Available documentation and software

The newest Collada specification can be found on the projects web page. All the supported elements are listed in the documentation.
Plugins for import and export are available for

- Maya
- 3ds max
- XSI

Source code for import/export routines are currently not available directly from the Collada site. A blender exporter plugin is available at SourceForge. Some other open source projects exist for the Maya plugin and for OpenScene-Graph support. There is a simple Collada viewer available at www.spilab.net.

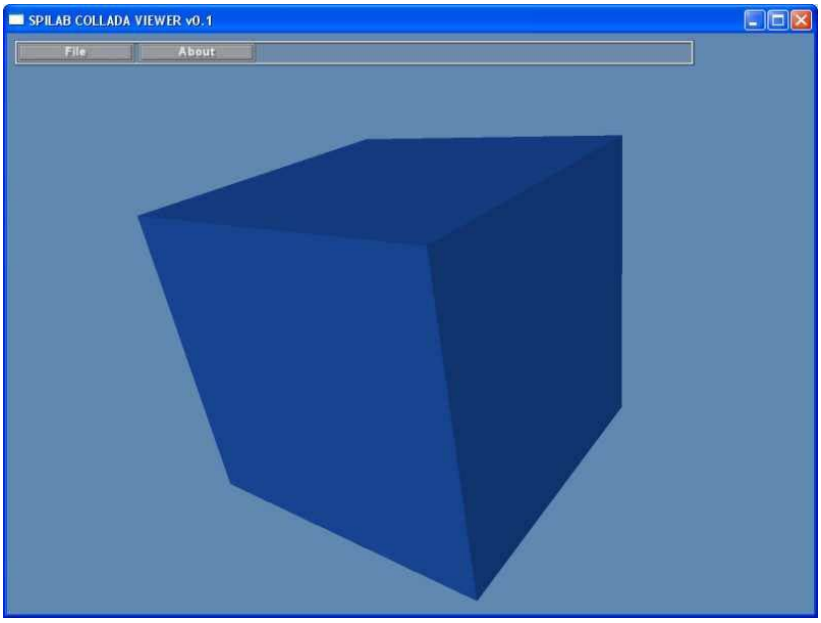

Figure 1: Simple Collada Viewer by SPILAB

3 Cons for Collada

Collada exists only a year now
Being relatively new Collada is not widely used by many applications. There are not yet many open source projects dealing with Collada. The documentation is not that detailed about all of the elements and the promised source code is only available for registered Collada developers. Many features are announced to be part of the Collada common profile soon, but who knows, when if at all it will be actually integrated.

No scripting support within the file format
The Collada schema is not supporting event handling nor scripting. Those features are left to be implemented in the applications. Also it is not supported to store audio/video data in Collada. It is questionable wheather those features are supposed to be stored within the file structure.

No open source API directly from Collada developers
In the official forum it says: *Unfortunately, SCEI is unable to release the COLLADA DOM (aka API) due to unresolved licensing issues. We are working with Khronos Group to transfer the software to Khronos. The plan is to release the software under the standard Khronos IP protection and licenses.*
The Khronos license allows developing software using Collada but to get early access to the draft specifications and download the conformance tests, for example, you have to buy a membership. The conformance test for X3D will also cost a fee.

4 Pros for Collada

XML standard without binary data
For collaborative projects data for different sources has to be readable for decades. By using an XML based file format the data is instantly internationally readable. XML parsers are available for nearly every platform and coding language. In extreme case a text editor can be used to read the data. Collada uses the XML standard to describe scene data as well as X3D. But while X3D allows binary data to be stored within XML, Collada explicitly bans binary data as a design guideline. Despite of that it could be possible for most of the data to be converted form Collada to X3D and the other way round e. g. using XSLT.

State of the art hardware orientation
Computer graphics hardware has developed fast allowing high quality visualization in low cost desktop pcs. One of the main reasons for Sony to support Collada was to get a format for the game development on their upcoming entertainment platform Playstation 3. Like the Playstation 2 its successor will certainly become a widespread graphics hardware. All kinds of visualizations will be compared to state of the art video games features. With Collada it will be possible to store all of those features.

Extensibility
The file format has to be extendable for present non standard functionality and future techniques. All of the introduced formats are extendable. The time and effort for extending the XML-based Collada and X3D format could be a bit smaller by using a standard XML parser API. Official extensions are released from time to time for the descibed formats. For Collada a so called common profile defines the scope of functionality. Additions are collaboratively developed by the Collada members and maybe become part of the common profile. As a guideline, all importers should ignore unknown data and leave it as it is for exporting.
The X3D format will grow by certified extensions onto a basic concept. Those extensions can be developed by a single institution. The Web3D consortium then decides whether to certify the extension or not.

5 Conclusion

In our opinion a common interchange format based on XML is helpful for collaboration. Collada and X3D are both suitable to exchange all kinds of data between different 3d applications in the production pipeline. With three major DCC vendors working together and being the official data exchange format for the upcoming Playstation 3 game console, Collada could become more popular for open source developers in the future. For now it is not clear, which companies are or will be using Collada. Besides Collada there is also the X3D format

available with more or less the same functionality. A conversion from one format to the other may be possible without much affort as both are based on the XML standard.

References

[1] 3DIF. http://www.3dif.org.
[2] Collada. http://www.collada.org.
[3] The Khronos Group. http://www.khronos.org.
[4] Web3D. http://www.web3d.org.

Appendix 5

The London Charter

Authors: The London Charter Committee
Date of document: 30th March 2006

Edited by Franco Niccolucci
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FIRST DRAFT

5 March 2006

THE LONDON CHARTER

FOR THE USE OF 3-DIMENSIONAL VISUALISATION IN THE RESEARCH AND COMMUNICATION OF CULTURAL HERITAGE

Preamble

Objectives

Principles

Principle 1: Subject Communities

Principle 2: Aims and Methods

Principle 3: Sources

Principle 4: Transparency Requirements

Principle 5: Documentation

Principle 6: Standards

Principle 7: Sustainability

Principle 8: Accessibility

PREAMBLE

While 3-dimensional visualisation methods are now employed in a wide range of contexts to assist in the research and communication of cultural heritage, it is now recognized that, to ensure that such work is intellectually and technically rigorous, and for its potential in this domain to be realised, there is a need both to establish standards responsive to the particular properties of 3d visualisation, and to identify those that it should share with other methods.

Numerous articles, documents, including the AHDS Guides to Good Practice for CAD (2002) and Virtual Reality (2002) and initiatives, including the Virtual Archaeology Special Interest Group (VASIG) and the Cultural Virtual Reality Organisation (CVRO) [et al.] have underlined the importance of ensuring both that 3d visualisation methods are applied with scholarly rigour, and that visualisation-inclusive research should accurately convey to users distinctions between evidence and hypothesis, and between different levels of probability.

This Charter aims to define the basic objectives and principles of the use of 3d visualisation methods in relation to intellectual integrity, reliability, transparency, documentation, standards, sustainability and accessibility.

It recognises that the range of available 3d visualisation methods is constantly increasing, and that these methods can be applied to address an equally expanding range of research aims. The Charter therefore does not seek to prescribe specific aims or methods, but rather seeks to establish those broad principles for the use, in research and communication of cultural heritage, of 3d visualisation upon which the intellectual integrity of such methods and outcomes depend.

Although the objectives and principles of this Charter may equally apply to the use of 3d visualisation in other contexts, such as in the creation of mass entertainment products, its main focus is upon research into cultural heritage and the communication of such research.

The Charter seeks to enhance the rigour with which 3d visualisation methods and outcomes are used and evaluated in the research and communication of cultural heritage, thereby promoting understanding of such methods and outcomes and enabling them to contribute more fully and authoritatively to this domain.

OBJECTIVES

The London Charter seeks to establish principles for the use of 3d visualisation methods and outcomes in the research and communication of cultural heritage in order to:

Provide a benchmark having widespread recognition among stakeholders.

Promote intellectual and technical rigour in such uses.

Enable appropriate evaluative criteria and methods to be determined and applied.

Stimulate debate on methodological issues.

Offer a robust foundation upon which specialist subject communities can build detailed standards and guides.

Ensure appropriate accessibility and sustainability strategies to be determined and applied.

Enable 3d visualisation authoritatively to contribute to the study, interpretation and management of cultural heritage assets.

PRINCIPLES

Principle 1: Subject Communities

The aims and objectives of this Charter are valid across all domains in which 3d visualisation can be applied to cultural heritage. Related specialist subject areas should therefore adopt and build upon the principles established by this Charter.

1.1 Specialist subject communities will need to develop more detailed principles, standards, recommendations and guidelines to ensure that use of 3d visualisation coheres with the aims, objectives and methods of their domain.

1.2 The adoption of and compliance with the principles of this Charter, across related specialist subject domains, will ensure that its broadly shared aims and objectives can be met.

Principle 2: Aims and Methods

Numerous types of 3d visualisation methods and outcomes exist, and can be used to address a wide range of research and communication aims. A 3d visualisation method should normally only be used to address an aim when it is the most appropriate available method for that purpose.

2.1 It should not be assumed that 3d visualisation is the most appropriate method of addressing all research or communication aims. Varied research and communication aims may demand the adoption of a variety of methods, including a variety of types of visualisation. 3d visualisation should not normally be used when other methods would be more appropriate or effective.

2.2 A systematic evaluation of the suitability of methods to each aim should be made, in order to determine whether some form of 3d visualisation is the most appropriate method.

2.3 A variety of available 3d visualisation methods should be carefully evaluated to identify which is the most likely to address each given aim. Consideration should be given as to whether the outcomes should be photo-realistic or schematic; high or low in detail; representations of hypotheses or only of the available evidence; static or interactive; "impressionistic" or "accurate". It is important to note that none of these options is inherently "good" or "bad"; rather, each proposed method should be assessed as to whether it is fit for the intended purpose.

2.4 It is recognised that, particularly in innovative or complex research contexts, it may not always be possible to determine, *a priori,* the most appropriate research method. However, the choice of method should be made carefully, based on the best available knowledge and experience, and be reviewed periodically, resources permitting, as the research process progresses.

2.5 The rationale for the choice of research method should be recorded in project documentation.

Principle 3: Sources

In order to ensure the intellectual integrity of 3d visualisation methods and outcomes, relevant sources should be identified and evaluated in a structured way.

3.1. Sources are defined as all information, digital and non-digital, considered during, or directly influencing, the creation of the 3d visualisation outcomes.

3.2 The evaluation of sources should be attentive to potential historical factors that may have impacted on primary sources.

3.3 Careful consideration should be given to the aims and contexts for both visualisation creation and dissemination in order to determine whether, or to what extent, the sources considered and the rationale for their interpretation, should be published with the 3d visualisation outcomes. (See Principle 4.)

Principle 4: Transparency Requirements

Sufficient information should be provided to allow 3d visualisation methods and outcomes to be understood and evaluated appropriately in relation to the contexts in which they are used and disseminated.

4.1 It should be made clear what kind and status of information the 3d visualisation represents. The nature and degree of factual uncertainty of an hypothetical reconstruction, for instance, should be communicated.

4.2 The type and quantity of transparency information will vary depending on the aims and type of 3D visualisation method and outcome being used, as well as the type and level of knowledge, understanding and expectations of its anticipated users. Transparency information requirements may therefore differ from project to project, or at different phases within a project.

4.3 Transparency information should be provided using the most appropriate available means and media, including graphical, textual, video, audio, numerical or combinations of the above.

4.4 Unless 3d visualisation can be evaluated independently of the authority claims of its creators, its significance as a research method or outcome remains indeterminable. Frequent opacity regarding the relationship of sources to outcomes makes 3d visualisation anomalous among research methods, and may help to account for the lack of recognition of 3d visualisation as a valid research process or outcome in certain subject communities. 3d visualisations outcomes should therefore be disseminated with sufficient information to allow the relevant subject communities to understand and evaluate the choice and application of the method in relation to its aims.

4.5 The high occurrence of dependency relations (see Glossary) within 3d models means that, in order for the process and its outcomes satisfactorily to be evaluated, it may be necessary to disseminate documentation of the interpretative decisions made in the course of a 3D visualisation process and, as far as is practicable, the sources used.

4.6 The level of documentation required regarding 3d visualisation when used as a research method will vary depending on how widely and well that method is understood within the relevant communities; novel methods will require more explanation. In addition, different levels of “assumed knowledge” apply within subject communities. Consequently, transparency information requirements may change as levels and sophistication of understanding of particular 3D visualisation methods rise, and will vary from community to community.

Principle 5: Documentation

The process and outcomes of 3d visualisation creation should be sufficiently documented to enable the creation of accurate transparency records, potential reuse of the research conducted and its outcomes in new contexts, enhanced resource discovery and accessibility, and to promote understanding beyond the original subject community.

5.1 When determining the nature and detail of documentation it is appropriate to create, and whether it should be process or outcome-orientated, consideration should be given to the aims, sources, methods, and dissemination strategies of the 3d visualisation method and outcome, and to transparency requirements, and to the desirability of reuse, enhanced resource discovery, accessibility and knowledge transfer.

5.2 Consideration should also be given to the distinctive properties of 3d visualisation processes and outcomes, including that, whereas "conventional" research outcomes enable, indeed often require, explicit statements about methods, theoretical concerns and arguments from evidence, this information may easily remain implicit within 3d visualisation processes and outcomes, rendering the meaning and significance of such research unknowable.

5.3 In addition, the high instance of dependency relationships in 3d models means that users require a correspondingly higher degree of detail if they are to understand and evaluate 3d visualisation outcomes than is the case with conventional textual narratives.

5.4 Whereas conventional research and dissemination methods operate, by definition, within an economy of established and understood approaches which have typically evolved through long histories of explicit methodological and theoretical debate, 3d visualisation methods and outcomes, by contrast, lack such a history, or economy, and must more explicitly discuss the rationale for their methods. An additional layer of complexity accrues to the fact that 3d visualisation methods are frequently used in interdisciplinary contexts which, again, by definition, lack a common episteme or set of conventions that generally characterise subject communities. Interdisciplinary work therefore requires additional reflectivity, in which systematic documentation can play an important role, by articulating the relevant unspoken assumptions and different lexica of the different subject communities engaged in the common visualisation process.

5.5 Project documentation should normally include a complete list of sources used, records of their evaluation for the purposes of 3d visualisation, the rationale for the visualisation method used. Explanation of the visualisation method used should also be documented if it is not likely to be widely understood.

5.6 Documentation methods should use the most appropriate available medium or media, and should be designed with reference to current working practices within the visualisation process in order to ensure that the process of documentation is sustainable in practice, and that it actively enhances the visualisation process by contributing to reflective practice.

5.7 Documentation should be durable and, where appropriate, compliant with appropriate established standards.

Principle 6: Standards

Appropriate standards and ontologies should be identified, at subject community level, systematically to document 3d visualisation methods and outcomes to be documented, to enable optimum inter- and intra-subject and domain interoperability and comparability.

Note: it was agreed at the London Seminar that it will be necessary to consider at subject community level which ontologies should be used to describe metadata and paradata (process-orientated transparency data).

However, we will only be able to begin to develop appropriate ontologies and choose appropriate standards as we improve our understanding of what it is we are doing when we use 3d visualisation methods and outcomes, and how we are doing it.

Initially, then, further research is required to help us understand and document 3D visualisation processes.

Principle 7: Sustainability

3d visualisation outcomes pertaining to cultural heritage and created in accordance with the principles established by this Charter, constitute, in themselves, a growing part of our intellectual, social, economic and cultural heritage. If this heritage is not to be squandered, strategies to ensure its long-term sustainability should be planned and implemented.

7.1 The most reliable and sustainable available form of archiving, appropriate to the 3d visualisation outcomes, should be identified and implemented.

7.2 It should be recognised that digital archiving may often not be the most reliable means of ensuring the long-term survival of 3d visualisation outcomes.

7.2 A partial, 2-dimensional record of a 3d visualisation output should be preferred to an absence of record. An assessment of the limitations of non-digital archival media (e.g. print and film) in capturing 3d visualisation outputs should therefore be balanced against the benefits of their relative longevity.

7.3 3d visualisation methods and outputs should not compromise their use of non-digitally archivable elements in order to facilitate recording for archival purposes. However, 3d visualisation methods should plan and implement a strategy to ensure that important information can be meaningfully evoked in archival media

Principle 8: Accessibility

Consideration should be given to the ways in which the outcomes of 3d visualisation work could contribute to the wider study, understanding, interpretation and management of cultural heritage assets.

8.1 Accessibility issues should be considered as part of the determination of aims, methods, source assessment and dissemination, standards, and sustainability of 3d visualisation work.

8.2 The roles that 3d visualisation has to play in enhancing access to cultural heritage not otherwise accessible for health and safety, disability, economic, political, or environmental reasons, or because the object of the visualisation is lost, endangered, dispersed, or has been restored or reconstructed, should be considered.

8.3 It should be recognised that 3d visualisation permits types and degrees of access not otherwise possible, including the study of change over time, magnification, modification, virtual object manipulation, multi-layered embedded data and information, instantaneous global distribution, with consequent expanded curatorial possibilities.

8.4 Appropriate stakeholders in cultural heritage domains should be consulted to ensure that maximum benefits are derived from 3d visualisation.

Appendix I – Glossary

The following definitions explain how terms are used within this document. They are not intended to be prescriptive beyond that function.

3d visualisation: The process of graphically representing information in three-dimensions.

3d visualisation method: The systematic application, usually in a research context, of 3d visualisation in order to address identified aims.

3d visualisation outcome: An outcome of 3d visualisation, including but not limited to models, still images and animations.

Cultural heritage: The Charter adopts a wide definition of this term, encompassing all domains of human activity which are concerned with the understanding of communication of the material and intellectual culture. Such domains include, but are not limited to, museums, art galleries, heritage sites, interpretative centres, cultural heritage research institutes, arts and humanities subjects within higher education institutions, the broader educational sector, and tourism.

Dependency relationship: A dependent relationship between the properties of elements within 3d models, such that a change in one property will necessitate change in the dependent properties. (For instance, a change in the height of a door will necessitate a corresponding change in the height of the doorframe.)

Paradata: The Charter defines "paradata" as information about human processes of understanding and interpretation of data objects. (Paradata is thus constantly being created, irrespective of whether they are systematically recorded or disseminated.) Example of paradata include a note recording method in a laboratory report, descriptions stored within a structured dataset of how evidence was used to interpret an artefact, or a comment on methodological premises within a research publication. It is closely related, but somewhat different in emphasis, to "contextual metadata".

Research: The Charter adopts the definition of research given in the British Arts and Humanities Research Council's *Research Funding Guide* (2005) which stipulates that research should: "address clearly-articulated **research questions or problems**, set in a clear **research context**, and using **appropriate research methods**." It stipulates, in addition, that the chosen research methods should constitute "the most appropriate means by which to answer the research questions." This definition therefore recognises that "the precise nature of the outputs of the research may vary considerably, and may include, for example, monographs, editions or articles; electronic data, including sound or images; performances, films or broadcasts; or exhibitions. Teaching materials may also be an appropriate outcome from a research project provided that it fulfils the definition above."[1]

Sources: Sources are defined as all information, digital and non-digital, considered during, or directly influencing, the creation of the 3d visualisation outcomes.

[1] Source: AHRC Research Funding Guide 2005, pp.15-16.
http://www.ahrc.ac.uk/ahrb/website/images/4_96278.pdf Accessed, 3 March 2006

Transparency: The provision of sufficient information, presented in any medium or format, to allow users to understand the “knowledge claim” made by a 3d visualisation outcome.

Appendix 6

Design and Usability Surveys Report for Cultural-Heritage IT Practitioners

Authors: Politecnico di Milano and University of Lugano
Date of document: 30th March 2006

Edited by Davide Bolchini [(1)] and Franca Garzotto [(2)]
University of Lugano [(1)] and Politecnico di Milano[(2)]

Table of contents

Executive Summary

This deliverable reports the results of two online surveys carried out to assess the practices of cultural heritage institutions (mainly European and North America) as far as the design and usability evaluation of interactive applications is concerned.
For the "design" survey, around 600 cultural heritage related institutions have been contacted (universities, research centers, museums, libraries, cultural heritage management centres) in a period comprised between June 2004 and December 2005. After two rounds of solicitation for filling out the online questionnaires, 27 responses were collected (for a response rate equal to 4,5%).
As to the practice in the design activity, some of the most salient results are the following:

- Applications are designed using "informal" methods and lightweight processes (favored over more formal approaches or workflow such as UML, which is not used or unknown to the majority of the sample), such as sketching, fast prototyping, iterative design, or others.
- Design specifications are mainly used as a communication tool with the clients and among the design team, but also to produce the "required" documentation for the project.
- Most of the institutions use graphics tools for documenting design ideas. However, a significant portion of the sample does not make use of any tool support.
- 25% of the characteristics of the final product is not traceable to the design specifications.
- The introduction of new design methods over the existing practice is perceived as useful especially if the new methods enable or facilitate the improvement of the usability of the final application.
- As to the introduction of novel design tools, they are expected to be beneficial mainly for better documenting design decisions.

For the "usability" survey, around 700 cultural heritage related institutions have been contacted (universities, research centers, museums, libraries, cultural heritage management centres, mostly shared with the previous sample) in a period comprised between June 2004 and December 2005. After two rounds of solicitation for filling out the online questionnaires, 48 responses were collected (for a response rate equal to 6,8%).
As to the practice in usability evaluation, some of the most salient results are the following:

- A significant part of the sample (25%) never carries out a usability assessment of their application using existing methods or techniques;
- Expert reviews, user observation and focus groups are the most used approaches to usability evaluation;
- 53% of the sample do not use any specific technique or method.
- The main target of the usability evaluation results are considered to be the designers and the project managers.
- 60% of the sample do not use any software tool in support of usability
- The design aspect where usability is perceived as most relevant is navigation;
- The introduction of new usability evaluation methods over the existing practice is perceived as useful especially if the new methods enable or facilitate the improvement of the usability of the final application and its overall quality.
- As to the introduction of novel usability tools, they are expected to be beneficial mainly for better documenting evaluation results (reporting usability evaluation findings).
- 20% of the sample does not know the W3C Web Accessibility Guidelines, and 30% of the sample feels as not up-to-date on current trends in accessibility practice.

- 60% of the sample never developed an application taking into account accessibility issues. However, 54% of them thinks to be going to develop applications considering these issues.

These initial results will be further elaborated to better understand the needs of the cultural heritage institutions as far as design and usability is concerned. Moreover, potential actions could be planned to introduce a more aware and reasoned usability and design practice in the cultural heritage domain (through workshops, coaching, mentoring, specific support to projects and sharing of state-of-the-art methodologies and practice drawn from other domains or from research advances).

Section I
Design Survey

1.1 Goal and Motivation

This survey is carried on in the context of the EPOCH project (http://www.epoch-net.org/) - workpackage 4.2.

This questionnaire aims at to investigating the current usage of design methodologies, identifying the most common approaches and practices currently adopted by cultural institutions in the design of digital applications.

We also attempt to identify some critical requirements for CH design methods, by understanding the needs and expectations of the various professionals involved in the design of multimedia applications in the specific field of cultural heritage (e.g., application analysts, domain experts, project managers, information architects, interface designers, application developers).

In particular, we want to explore the characteristics that should be provided by a design method in order to be accepted and effectively used in CH projects.

1.2 The “design survey” online questionnaire

http://www.tec-lab.ch/epoch_design_survey

EPOCH Survey on design methods for Cultural Heritage applications

Date of compilation

day (Click here to choose)

month (Click here to choose)

year

Name of the company/institution

Size of the company/institution (number of people)

Your division/department profile (if applicable, please check one or more)

- ☐ Administration
- ☐ Preservation and safeguarding
- ☐ Research
- ☐ Education
- ☐ Technology
- ☐ Other (please specify):

Your company website (if any)

http://

SECTION 1: CURRENT PRACTICE

The purpose of this section is to explore the methodological approaches you use today in the design process of cultural multimedia applications.

1. How do you design your applications?

- [ ] Informally
- [ ] Formally

In both cases, please describe how:

2. Do you use UML?

- [ ] Yes
- [ ] No

If yes, which modeling features of UML do you use most?

3. How do you use your design "specifications" (either formal/semi-formal or informal)?

- [ ] To discuss with all members of the design team
- [ ] To discuss with the customer
- [ ] To provide input to the following development activities
- [ ] To produce the required project documentation
- [ ] Other (please specify):

4. How do you manage your design process?

- [ ] Informally
- [ ] Formally

In both cases, please describe how:

5. Do you use support tool(s) to write/sketch/draw/exemplify your design solutions?

- ☐ Yes
- ☐ No

If yes, please describe which one(s):

6. At what degree are your design specifications usually reflected in the final product?

- ☐ 0 %
- ☐ 25 %
- ☐ 50 %
- ☐ 75 %
- ☐ 100%

SECTION 2: THE NEXT METHODOLOGY

The purpose of this section is to investigate your opinions about factors and motivations that may prevent or promote the adoption of a new design method.

7. Which improvements and benefits do you expect from a new design method? Please rate your answer.

	Minimal Improvement	High Improvement
Productivity of development	☐	☐
Quality of the application	☐	☐
Usability of the application	☐	☐
Communication skills within the development team	☐	☐
Reduction of errors	☐	☐
Reduction of changes	☐	☐
Other (please specify below)	☐	☐

Comments and suggestions:

8. If a design method was proposed to you, which characteristic of such a method would you consider most relevant? Please rate your answer.

	Absolutely necessary	Very relevant	Relevant	Not relevant
Lightweight (easiness to learn and to apply)	☐	☐	☐	☐
Standard	☐	☐	☐	☐
Guidelines and design patterns	☐	☐	☐	☐
Process model	☐	☐	☐	☐
Flexibility (possibility of using the method in multiple ways)	☐	☐	☐	☐
Customizability (possibility of creating your own version of the method)	☐	☐	☐	☐
Scalability (possibility of adopting a method partially and progressively, first adopting some features only and later extending the use)	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐

Comments and suggestions:

9. If tools for design were proposed to you, which feature would you consider most relevant? Please rate your answer.

	Absolutely necessary	Very relevant	Relevant	Not relevant
Appropriate documentation	☐	☐	☐	☐
Training support	☐	☐	☐	☐
Consultancy support	☐	☐	☐	☐
Tools for project management	☐	☐	☐	☐
Tools for authoring design specifications	☐	☐	☐	☐

	Absolutely necessary	Very relevant	Relevant	Not relevant
Tools for fast prototyping	☐	☐	☐	☐
Tools for application generation	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐

Comments and suggestions:

10. How much time do you expect to spend in order to learn and be able to apply a new design method?

☐ Less than 1 week

☐ 1 to 2 weeks

☐ More than 2 weeks

Comments and suggestions:

11. Which type of training do you find more appropriate in order to learn a design method (e.g. on-line courses, mentoring, practice courses)?

GENERAL COMMENTS TO THIS QUESTIONNARIE

Would you like to receive the final report of this study?

☐ Yes

☐ No

If yes, please specify your e-mail address:

THANKS AGAIN FOR YOUR COOPERATION!
The EPOCH Team at HOC-Politecnico di Milano and TEC-Lab University of Lugano

Submit Survey

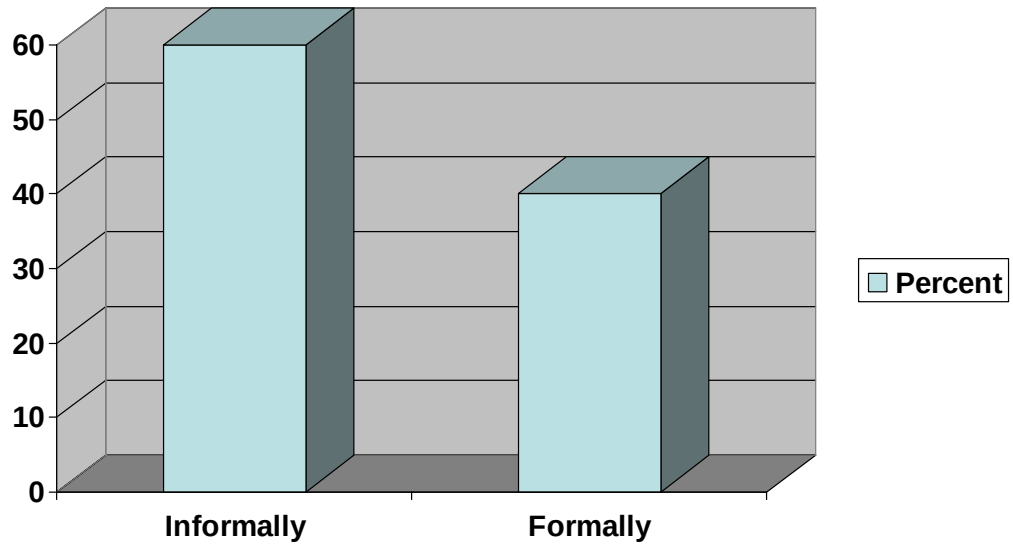
1.3 Sample contacted and actual responses

Survey Fact Sheet

Survey Period: June 2004 – December 2005
Sample contacted: 600
Solicitation rounds: 2
Sample Answering: 27 responses
Response Rate: 4,5%

1.4 Excerpts of key results

1. How do you design your applications?

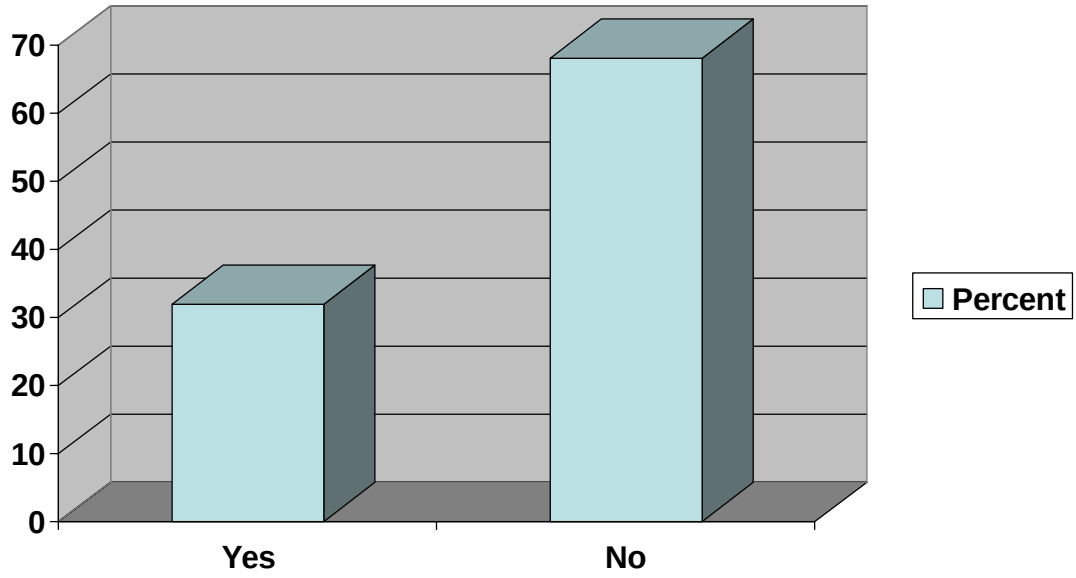


In both cases, please describe how:

- See http://www.eduweb.com/process.html Create flowchart with inspiration application
- Our programs are designed in consort with designers and programmers with the museum visitor in mind. We run every program through a rigorous requirements, audience evaluation, usability, implementation and final evaluation phase. We use Flash-based templates that were designed 5 years ago.
- We have pre-established interactive Flash templates designed with pedagogical ends in mind. We also ask visitors their questions about artworks under consideration. That said, our actual content development process includes a lot of onformal brainstorming.
- We are doing just research in digital methods for cultural heritage objects. The development is continues process and methods are implemented one by one.
- We most often use a project plan and a methodology loosely based upon the spiral methodology (see http://www.hyperthot.com/pm_sdm.htm) with parts of other methodologies included as necessary. Qualitative user testing is always integrated into each design iteration, however.
- I have been designing adhoc bit want to systemize my processes and take on employees so creating a systematic approach will allow me to hire less experienced people and train them faster.
- agree specification, develop concepts and test on users via rapid prototypes, proceed iteratively until satisfactory design concept is agreed. Repeat process with increasing degree of softwar encoding.
- follow a software design and implementation methodology

- We use different commercial software packages, especially for visualisation of 3D models.
- We apply a a set methodology before we begin a project which could include focus groups with our target audience and then usability testing during the development stage. In other words we design with our target audience in mind and try to suit their needs and abilities.
- My training (Ed.M., Harvard) is in Interactive Technologies in Education. I am familiar with approaches such as formative evaluation in the design process. We work with a variety of institutions, from zoos to children's museums to local history museums, and the process is primarily informal depending on the focus of the institution. Generally, we provide an interactive concept, sample storyboards, 2-3 alternative design treatments, followed by a prototype program for evaluation.
- We use a life cycle management approach to projects.
- The work is organized in project forms: definition of goals, making concepts, resulting specifications, prototype versions, evaluation, final implementation and documentation
- I collaborate with a single individual (client) or with internal clients (museum staff) to produce healthy designs for exhibitions
- With UML, but since it is not formal, my answer was informally.
- we start from use case analysis and from the identification of non functional constraints and requirements. We use UML diagrams to support the various design phases. When needed, we use formal methods on portions of the architecture.
- on an as needed basis
- Approximate user needs and behaviours with use cases.
- Many interviews, then documents stating the system to be developed
- There is a main website that it is actualized from time to time. There is no regular staff that takes care of the website. The TIS director is in charge of all the technological needs of the institution and inserting information regarding Special Events, Workshops and Public Programs.
- An iterative series of steps encompassing the major steps of: requirements capture, design specification, intial concepts, prototypes, final delivered design; interspersed with user testing at each stage and managed overall in a workplan comprising separate work packages with milestones, deliverables and budgets.
- We have for each project a Coordinator and many external consultants. We organize periodically meetings in order to discuss the state of art of our project
- We decide on a project, usually of a fairly high professional level (we don't do most of our interactive work in house), look for funding and then once we receive it, follow through with completing it.

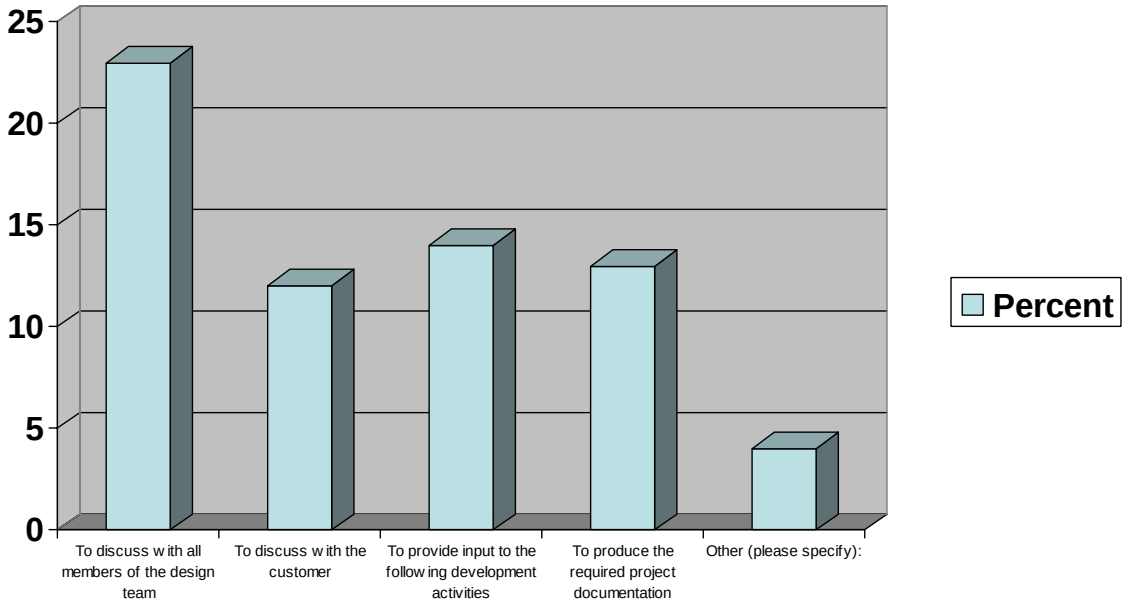
2. Do you use UML?



If yes, which modeling features of UML do you use most?

- What is UML?
- Use cases and class diagrams.
- class diagrams mainly, perhaps some use case.
- Class diagrams for GIS-Database development. Not for multimedia purposes.
- I am not familiar with the term "UML".
- class diagrams
- all
- Use case to spec phase
- class diagrams
- I am not able to answer this question.
- I don't know what UML is

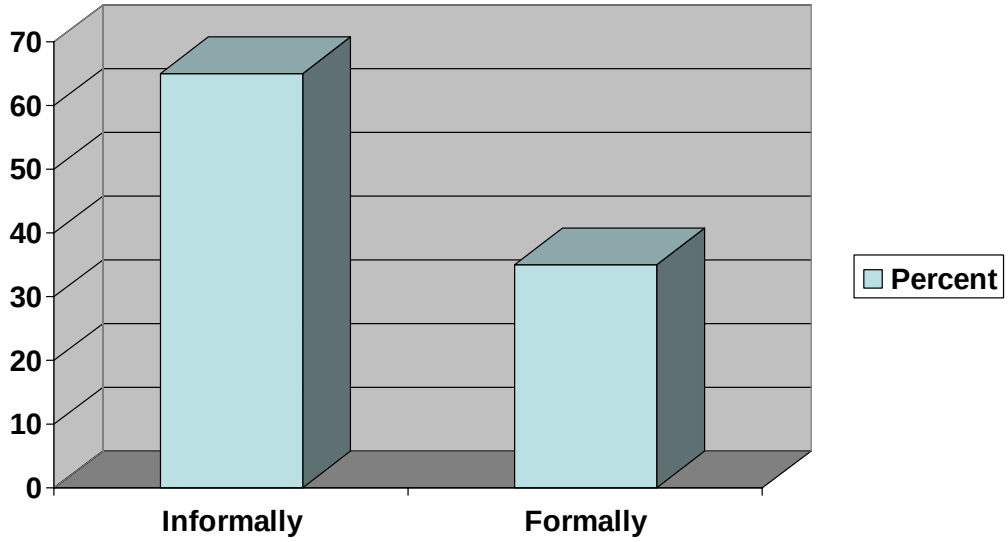
3. How do you use your design "specifications" (either formal/semi-formal or informal)?



Other use of design specifications:

- to discuss with content people
- Having design specs inspirs collaboration from any and all staff members...even security
- At this moment there is no design specifications
- To discuss with end users

4. How do you manage your design process?

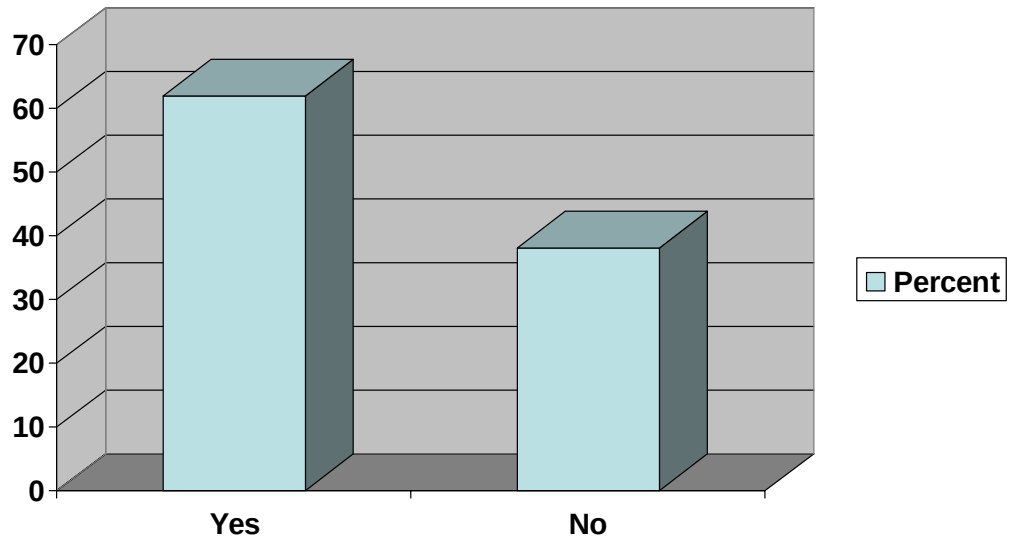


Describe how you manage your design process:

- See http://www.eduweb.com/process.html
- hands on meetings, discussions, paper-based prototypes, lots of revisions/additions, and finally usability studies, bug testing. sometimes specifications get lost in translation or in implementation phase.
- We have a specific sequence of steps in our desig/content development & production process, but the general atmosphere is informal, and dependent on securing assets from afar, so the timeline can be subject to change!
- General level design and documentation format are agreed in a group meeting.
- If there was a 'semi-formally' button I would have selected that! We try and design as rapidly as possible so that each stage of the design can be tested with users. We do use project planning software, but the plan is very rarely stuck to and changes a lot, as we try and react to the input of the users as much as possible.
- I have been using Microsoft Word and Excel to keep track of documentation. I also have an Intranet that I adapted from a Open Source e-Learning application.
- Monitoring by project manager, overseen by director, of progress aginst spwecified milestones within defined work packages.
- We usually have Gantt charts.
- I do not know what you mean by "formally". We identify phases and priorities and plan the design/development based on these.
- We appoint people as necessary to do certain parts of the design/creative work
- very loose use of life cycle concepts
- It is very small. In particular, one person is doing the development.
- Our TIS director receives the informations from different departments such as Education, Special Events and Membership and he adds it to the specific section at the website. Not a good practice but it has been the SOP for the past 5 years, since the foundation of the institution.

- An overall a workplan and schedule comprising separate work packages with milestones, deliverables and budgets.
- We organize periodically meetings with allo member of the project
- It's project based and ad-hoc, depending on who is a stakeholder in the process at the time

5. Do you use support tool(s) to write/sketch/draw/exemplify your design solutions?

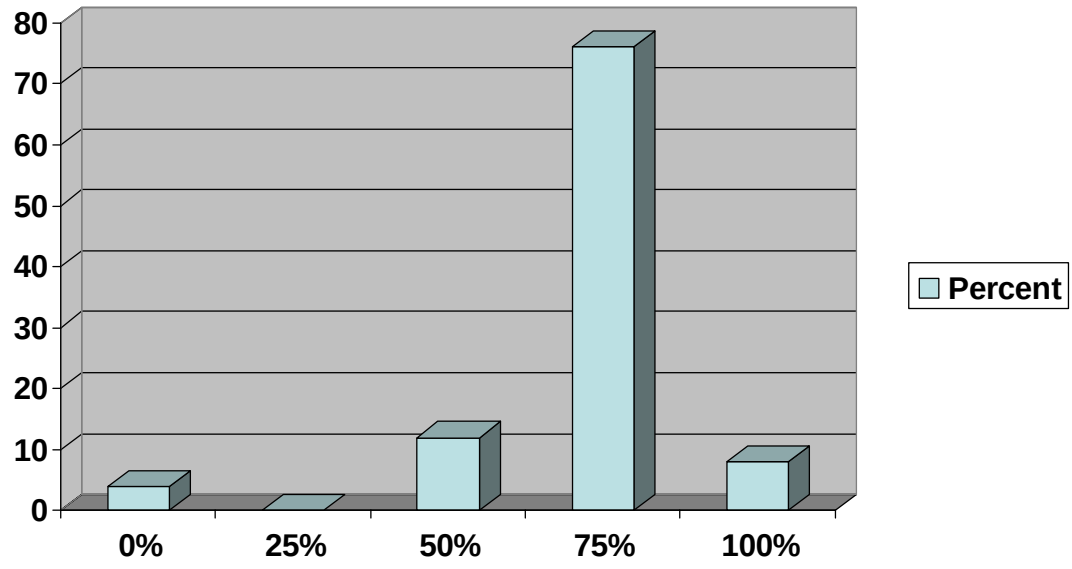


If yes, describe which support tool do you use.

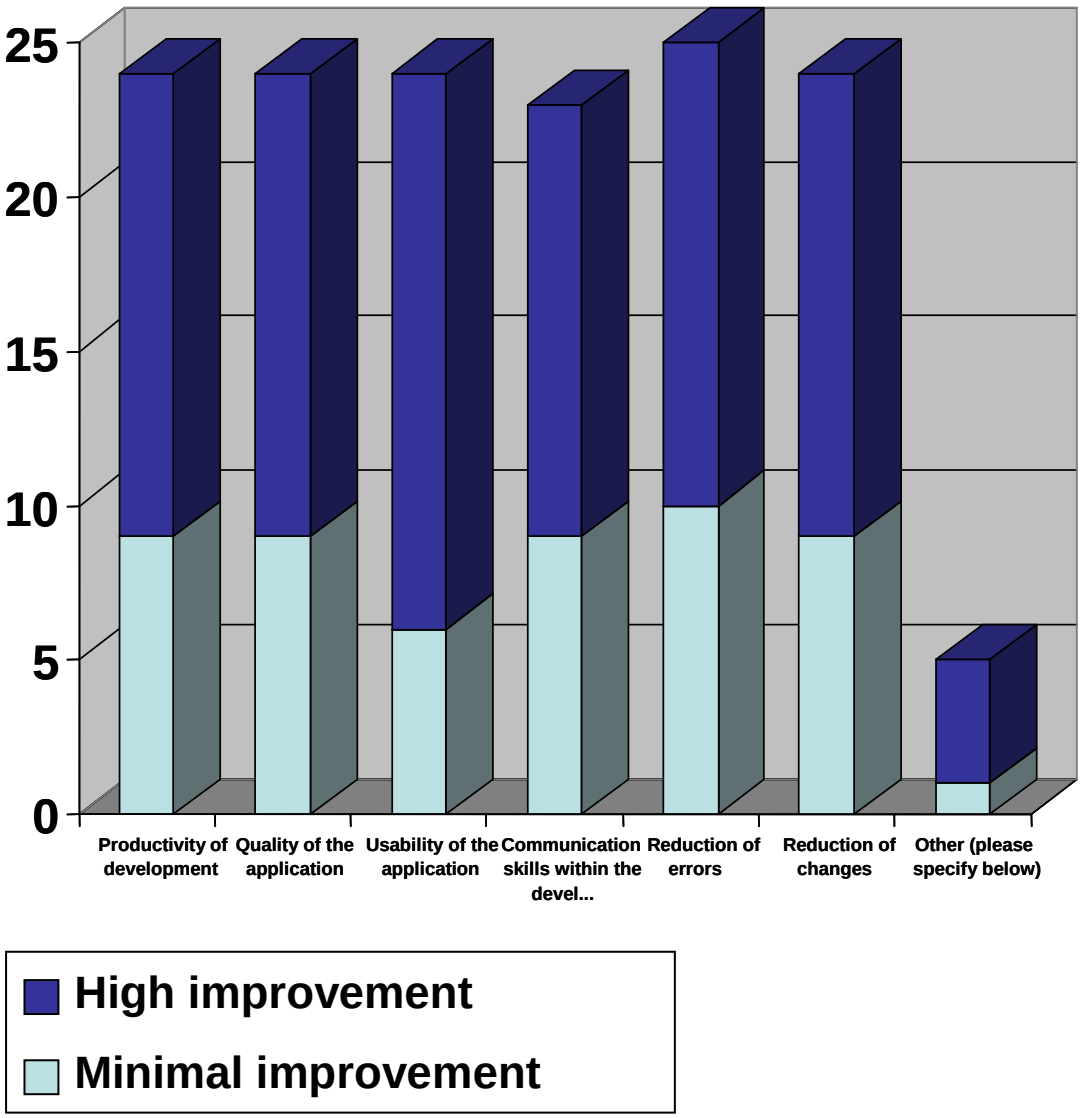
- self designed tools
- Canvas, Illustrator, Word
- illustrator, photoshop, flash, paper/pencil/notes scratched on napkins, etc. is this what you mean?
- We have PDF versions of all our interactive templates which allow us to specify which media go where, and how the user experience will be sequenced.
- We use Matlab and it is used also as a prototyping tool.
- Paper, glue and felt-tipped pens. We also mock-up applications in wireframe using Adobe Illustrator. We sometimes record testing with a DV camcorder. Later iterations are hand coded in XHTML and / or mocked up using Adobe Photoshop.
- Visio 5
- Photoshop, Illustrator, Flash.
- visio or power point, word
- We use a white board at the beginning of the project. The content inventory and creation is done first and from that the navigation structure is determined. We use Visio do draw out the site architecture and wire frames. The designer uses Illustrator to create the graphics and the developer used Flash and Dreamweaver to build the application
- I tend to do storyboards by hand. This usually feels sufficient.
- Visio
- paper sketch and adobe photoshop, sometimes also flash
- Again I use Vectorworks 12 (www.vectorwors12.net)for drawing. Project 2003 by Microsoft, Excell at times, Corel Draw 12 and Corel Photo 12 for graphics. we have a wide format printer to output most every form of graphics for us. I have a very creative collection of soft and hard tools.
- Currently, we used Gentleware Poseidon.
- Cinema 4D or Director

- pencil and paper Adobe illustrator Photoshop

6. At what degree are your design specifications usually reflected in the final product?



7. Which improvements and benefits do you expect from a new design method?

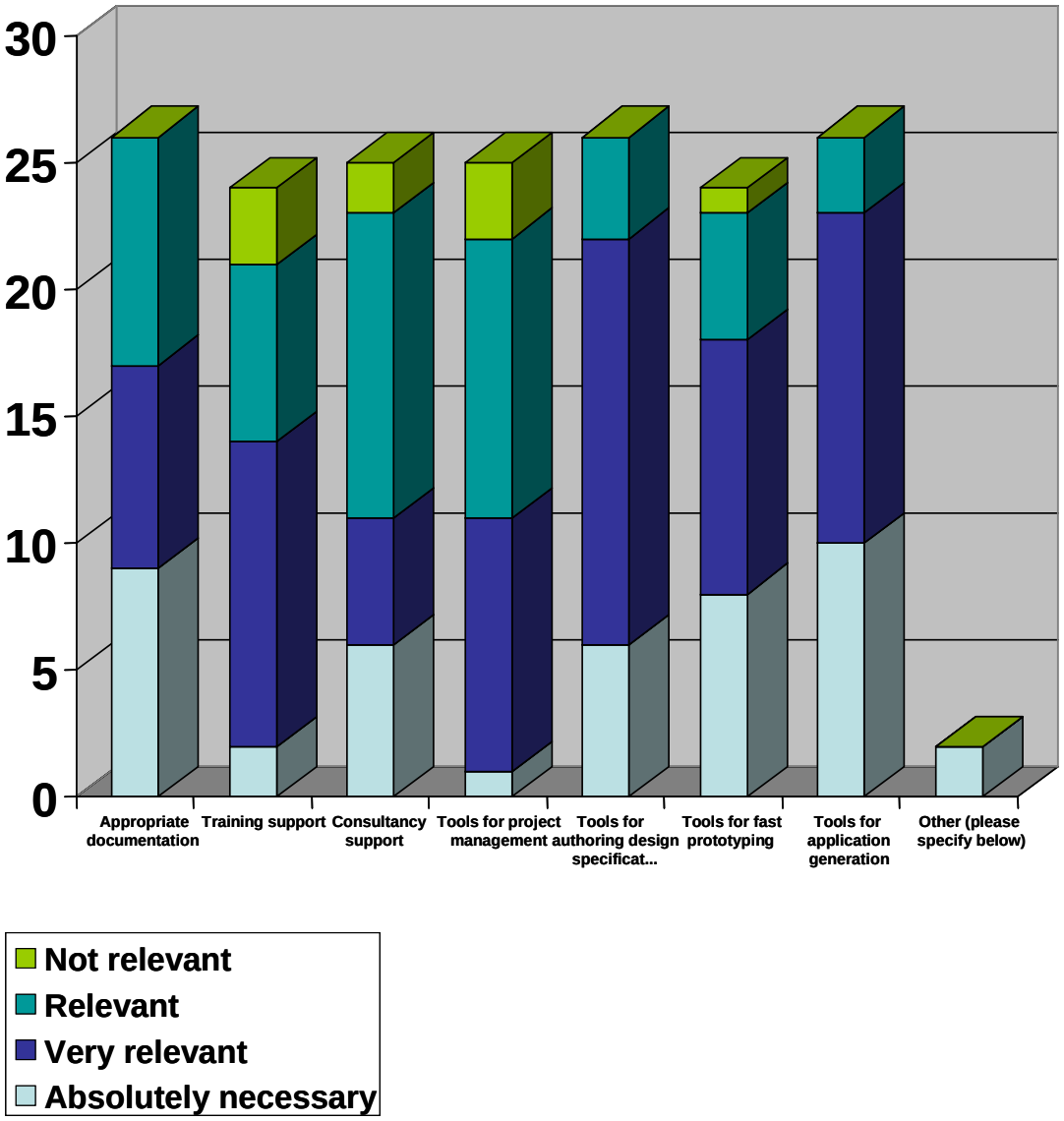


If other, please specify:

- Communication skills with clients and end users.
- better documentation
- more intuitive interface design
- These might be the expectations but they do not rely on the reality.
- It's rare for professional IT developers to stick to one methodology- usually you would use bits of several: which bits would depend upon the project itself, its timescale and so on.
- It all depends on the nature of the method and why it is being adopted. A single method is unlikely to achieve all of the above.

- We feel we are happy with our existing methodology taken from the instructional design model
- In general, I have been happy with the quality and usability of our projects. However, if there were particular tools that would improve productivity and communication within the team, I'd be very interested in learning more.
- Its all about all members who are interested to have input into the design process. To allow respectfull listening. Many times an oddball suggestion will trigger a valuable tangential thought and design. Communication, creativity, inclusiveness, innovation and FUNtional exhibits.
- Ease of use, MDA approaches, validation, automatic code generation. The list above is really flat and poor.
- Usability is a very important crierion but I would not expect a design method to make a significant difference to this aspect unless the method was specifically intended to do so.

9. If tools for design were proposed to you, which feature would you consider most relevant?



10. How much time do you expect to spend in order to learn and be able to apply a new design method?

- training with live people would help a great deal. need a person to call with questions.
- A tool that is easy to learn can be adopted by a wider number of employees with less skills and this reduce employment costs.
- I prefer intensive training to get it over with and to just get up and running on new processes
- I don't want to use methods. I want to use design notations and my design methods.
- We don't have a lot of time or support (people or money wise) to learn new technology or ways of doing things
- There are so many other projects and draws of time in my job and since we don't have an official tech person, we learn the basic of what we need to know in the shortest amount of time

Section II
Usability Survey

2.1 Goal and Motivation

This survey focuses on usability – a fundamental factor for the overall quality of an interactive application.
The following questionnaire aims at to investigating the current usage of usability evaluation methods, identifying the most common approaches and practices currently adopted by cultural institutions in the development of digital applications.

We also attempt to identify some critical requirements for CH evaluation methods, by understanding the needs and expectations of the various stakeholders involved in the evaluation activities of CH applications (e.g., application analysts, domain experts, project managers, information architects, interface designers, end users).

In particular, we want to explore the characteristics that should be provided by an evaluation method in order to be accepted and effectively used in CH projects.

The information gathered– together with the data collected from other questionnaires - will work pave the ground for defining guidelines, heuristics and best practices concerning evaluation of cultural multimedia, and for the identification for the criteria that a usability methodology should satisfy in order to be accepted and effectively adopted in the cultural heritage world.

2.2 The “usability survey” online questionnaire

http://www.tec-lab.ch/epoch_usability_survey

EPOCH Survey on usability evaluation for Cultural Heritage applications

Date of compilation

day (Click here to choose)

month (Click here to choose)

year

Name of the company/institution

Size of the company/institution (number of people)

Your division/department profile (if applicable, please check one or more)

- ☐ Administration
- ☐ Preservation and safeguarding
- ☐ Research
- ☐ Education
- ☐ Technology
- ☐ Other (please specify):

Your company website (if any)

http://

SECTION 1: CURRENT USABILITY PRACTICE

The purpose of this section is to explore the tools and techniques you use for evaluating cultural multimedia applications.

1. When do you use techniques or methods to evaluate the usability of your interactive applications?

- Never
- Sometimes
- Always

If you answered "never" please go to Section 2.

2. In which phase(s) of a cultural multimedia application lifecycle do you usually perform usability evaluations?
(e.g. requirements management, design, implementation)

3. Which general approach do you primary used for performing usability evaluations of your applications?
(e.g. expert analysis, empirical evaluation)?

4. If the evaluation of your application is performed through observation of user sessions, where do you collect data?

- In the "natural" context" of use of the system (e.g. in the museum, in the working environment, at home)
- In an artificial environment (e.g. usability laboratory)

5. Do you use any specific technique or method for the usability evaluation?

- Yes
- No

If yes, please describe which one:

6. Who is the typical target of the usability evaluation (e.g. the project manager, the visual designer)?

7. Do you use any software tool or equipment to support the usability evaluation?

- ☐ Yes
- ☐ No

If yes, please describe which one:

SECTION 2: THE NEXT METHODOLOGY

The purpose of this section is to investigate your opinions about factors and motivations that may prevent or promote the adoption of a new usability evaluation method.

8. How relevant is usability? Please rate your answer.

	Very relevant	Relevant	Not relevant
Overall	☐	☐	☐
Contents	☐	☐	☐
Navigation	☐	☐	☐
Lay-out	☐	☐	☐
Services	☐	☐	☐
Other (please specify below)	☐	☐	☐

Comments and suggestions:

9. Which improvements and benefits do you expect from a new usability evaluation method? Please rate your answer.

	Minimal Improvement	High Improvement
Productivity of development	☐	☐
Quality of the application	☐	☐
Usability of the application	☐	☐
Communication skills within the development team	☐	☐
Reduction of errors	☐	☐
Reduction of changes	☐	☐
Other (please specify below)	☐	☐

Comments and suggestions:

10. If a usability evaluation method was proposed to you, which characteristic of such a method would you consider most relevant?
Please rate your answer.

	Absolutely necessary	Very relevant	Relevan
Lightweight (easiness to learn and to apply)	☐	☐	☐
Standard	☐	☐	☐
Guidelines and heuristics	☐	☐	☐
Process model	☐	☐	☐
Flexibility (possibility of using the method in multiple ways)	☐	☐	☐
Customizability (possibility of creating your own version of the method)	☐	☐	☐
Scalability (possibility of adopting a method partially and progressively, first adopting some features only and later extending the use)	☐	☐	☐
Other (please specify below)	☐	☐	☐

Comments and suggestions:

11. If tools for usability evaluation were proposed to you, which feature would you consider most relevant? Please rate your answer.

	Absolutely necessary	Very relevant	Relevant	Not relevant
Appropriate documentation	☐	☐	☐	☐
Training support	☐	☐	☐	☐
Consultancy support	☐	☐	☐	☐
Method-specific tools for collecting evaluation data	☐	☐	☐	☐
Method-specific tools for structuring and analyzing the evaluation results	☐	☐	☐	☐
Support tools for reporting the evaluation results	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐

Comments and suggestions:

12. How much time do you expect to spend in order to learn and be able to apply a new usability evaluation method?

- ☐ Less than 1 week
- ☐ 1 to 2 weeks
- ☐ More than 2 weeks

Comments and suggestions:

13. Which type of training do you find more appropriate in order to learn a usability evaluation method? (e.g. on-line courses, mentoring, practice courses)

SECTION 3: ACCESSIBILITY

The purpose of this section is to investigate your opinions and needs about the factors that contribute to the accessibility of a CH application.

14. Are you aware about accessibility issues and problems in interactive applications?

- Yes
- No

15. Do you know the Web accessibility guidelines provided by W3C?

- Yes
- No

16. Are you updated about the current research trends in accessibility for interactive applications?

- Yes
- No

17. Did you ever developed any application considering accessibility issues?

- Yes
- No

If yes, please describe the case(s)

18. Are you going to develop any application considering accessibility issues?

- Yes
- No

If yes, please describe the case(s)

GENERAL COMMENTS TO THIS QUESTIONNARIE

Would you like to receive the final report of this study?

- Yes
- No

If yes, please specify your e-mail address

THANKS AGAIN FOR YOUR COOPERATION!
The EPOCH Team at HOC-Politecnico di Milano and TEC-Lab University of Lugano

Submit Survey

Powered by SurveySolution

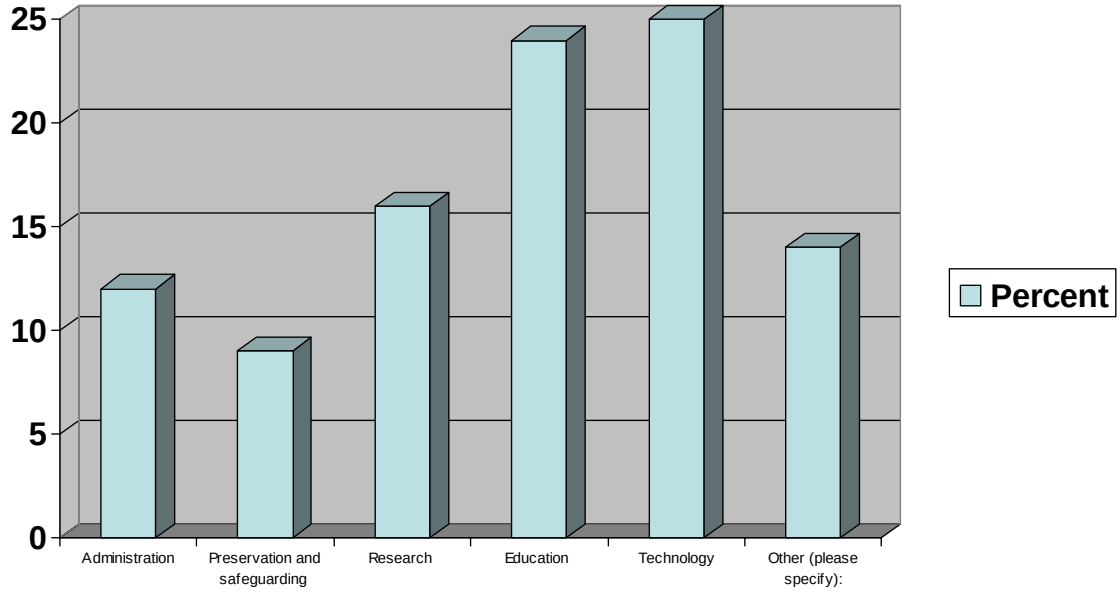
2.3 Sample contacted and actual responses

Survey Fact Sheet

Survey Period: June 2004 – December 2005
Sample contacted 700
Solicitation rounds: 2
Sample Answering: 48 responses
Response Rate: 6,8%

2.4 Excerpts of key results

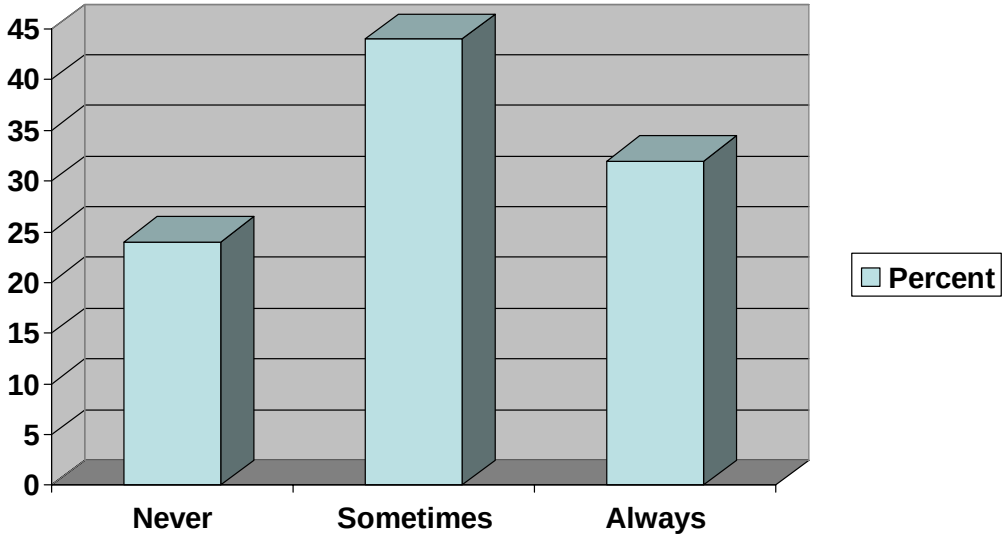
Your division/department profile (if applicable, please check one or more)



PART 1: CURRENT USABILITY PRACTICE

The purpose of this section is to explore the tools and techniques you use for evaluating cultural multimedia applications.

1. When do you use techniques or methods to evaluate the usability of your interactive applications?



2. In which phase(s) of a cultural multimedia application lifecycle do you usually perform usability evaluations? (e.g. requirements management, design, implementation)

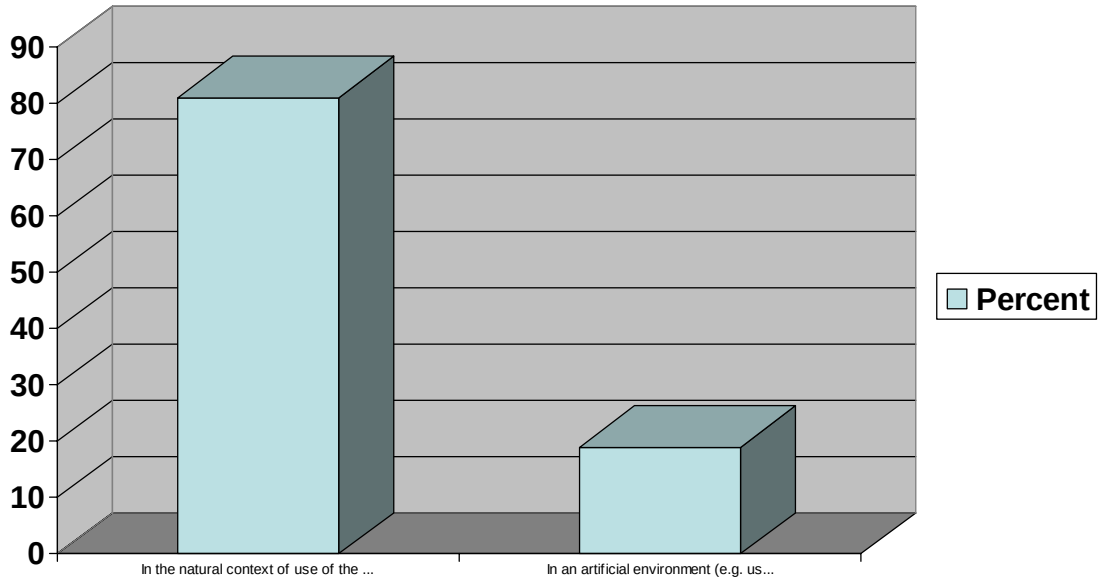
- Conceptually we consider usability during design phase, but practical evaluation happens in the early implementation stage.
- Requirements management and iteratively throughout the design process.
- All
- requirements
- design and implementation. The requirements we do by "educated guessing" since we know our field well. Then we implement methods and in order to write a paper we ask users what they think about it.
- requirements capture, design specification, initial concept, prototype, final design
- Design
- During all design process, including HCI design and implementation: We work in a research project that deal with usability testing into a Museum.
- Before and during the application or before and the end of a specific program.
- users study
- design
- Genearly prototyping during design development
- design, implimentation
- Accessibility, exit surveys and program evaluations
- design and implementation
- We begin usability testing in the early design phase.
- prior to a redesign of an existing product; durin design, and just following production
- post-implementation
- formative evaluation and summative evaluation (prototyping and post installation)
- requirements, design, pre-launch QA
- Right before we go live, during the design process, and even consider it before programming anything.
- design/implementation - we are pretty small.
- design phase via prototyping initially. Then as part of the QA performed before the implementation phase activities commence.
- design and pre-implementation
- 1. technical beta during production of web delivered multi media 2. audience/user and system testing before publication 3. market evaluation around sales and promotion
- alpha/prototype, beta and launch
- design and implementation
- we don't have any multi-media applications - perhaps that sghould have been the first qualifier?
- sviluppo e design
- implementation
- user requirements gathering, design adn final evaluation
- throughout
- implementation
- Requirements, design and implementation
- During the implementation, to make sure it works
- design, beta test

3. Which general approach do you primary used for performing usability evaluations of your applications? (e.g. expert analysis, empirical evaluation)

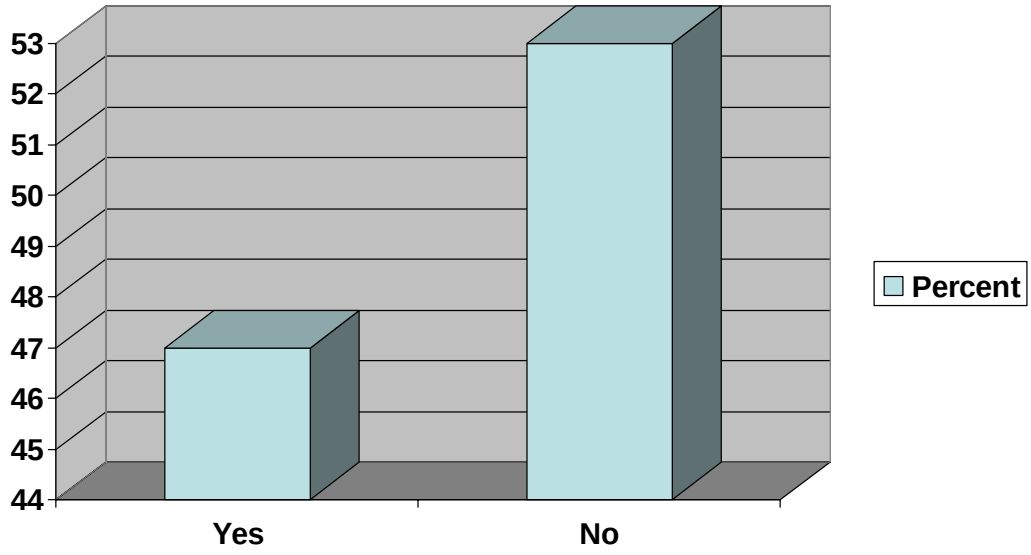
- focus groups
- During requirements capture: heuristic evaluation of existing sites. During design: usability testing / paper and other lo-fidelity prototyping methods.
- Expert analysis; testing on users
- emprirical evaluation
- empirical evaluation. We develop in the field of graphics, and only part of our software is for end users. Most of it is developed for testing algorithms.
- empirical evaluation through user trials, supported by W3C WAIS tools
- Focus groups; contacting users
- We start with heuristic evaluation (during the HCI design process and implementation) and then we observ user sessions.
- Expert analysis and audiences evaluations.
- expert analysis and empirical evaluation
- focus group, observation
- front-end requirements gathering card sorting and cluster analysis prototyping web server stats analysis
- empirical evaluation, plus comments received
- Meeting current regulations, review of evaulation data
- empiracle evaluation. in depth communication with a project team. This is conducted in both a lab and real environment
- Empirical evaluations using paper prototypes and early prototypes. We solicit expert analysis when drafting an initial domain analysis.
- expert analysis, focus groups, user observation, surveys
- evaluation teams comprising users and experts (surveys); automated tools; focus groups; ;user sessions
- passive observation and surveys
- Observations, interviews
- Focus Groups (feature discovery), questionnaires, high-fidelity user testing, internal expert audits
- user testing
- Performance testing with individuals, partners, focus groups.
- It depends on the project/application. THere are primarily two types of tests performed: 1) technical and 2) user interface. The Technical usability evaluations can very from testing of the code, the testing of interoperatability, robustness, performance et al. The User Interface usability are practical hands on activities where a random sampling of users is polled to test and recieve feedback on their impressions, expectations and general usability of the system. Therefore, traditionally, in #1) technical we use a prescribed checklist for each type of evaluation. The checklists contain requirements, features/functions and the technical components. They are created for each type of initiative we undertake. There is no one model that works for all situations or expectations. The user interface evaluations of course vary even more but the processes undertaken are similar 95% of the time.
- 1. in house technical review and technical problem solving 2. student assignments and reports 3. direct consultation with clients
- combination of analysis by subject matter, design and usability experts as well as empirical evaluation of small (5-12) person user groups

- Expert analysis (albeit not rigorously heuristic), paper prototyping, scenario-based observation in usability lab or on-site, empirical observation (#4 won't allow us to answer "Both" but we have done both in the past. Now it's more likely to be on-site.) expert analysis
- empirical evaluation
- expert anaysis at an early stage of development and later final user studies (empirical evaluation)
- informal user studies
- Work centered evaluation, based on cognitive systems engineering. The approach involves empirical evaluation as well as expert analysis
- empirical evaluation
- Inhouse quick usability studies and testcases done by web staff
- only the designers, relevant people asked to try it out informally
- expert analysis, user surveys,

4. If the evaluation of your application is performed through observation of user sessions, where do you collect data?



5. Do you use any specific technique or method for the usability evaluation?



If yes, please describe which one:

- we have hired a special evaluation group to work with different profiles of our website
- Most times we look at how people behave (e.g., if they fall down in our CAVE) and ask them what improvements they would like. Only once a student of psychology did a thorough usability study for his thesis, with 60 firemen learning a building in our CAVE.

- we use a combination of approaches including observation of users performing tasks, focus groups, questionnaires and web accessibility analysis using Watchfire
- variable
- For the user sessions, we use communicability evaluation.
- 1- One on one basis either in the Museum or by phone. 2- Electronic data such as Touch Poll.
- online survey sensemaking interview observation of users session meta-analysis of users study weblogs analysis
- We check each item over for any damage -ie we have some wood items & we don't want children to get splinters. We always do visual checks as the end of each day
- front-end requirements gathering card sorting and cluster analysis prototyping web server stats analysis
- Empirical observation using early prototypes as well as structured questionnaires with pre-selected subjects.
- a variety of techniques are used
- We usually do cued testing. We invite people to use the interactive (and we observe them) and when they are done, we interview them.
- The method we follow is an inhouse created methodological approach and analysis process. In essence, test cases are developed, plausible scenarios and then our own staff are first polled and results noted and review. Any changes or enhancements are documented (and potentially implemented). Then, the scenarios and test cases are created for the "users" that are polled to represent certain "user types". The users are

then given various scripts for 50% of their time and the remaining 50% is theirs to use and document the good, the bad usability items as well as recommend any improvements to them or new functionality. Again this is an overview of what we use. It is the combination and hybrid of many of the more formal canned techniques offered in the IT marketplace.

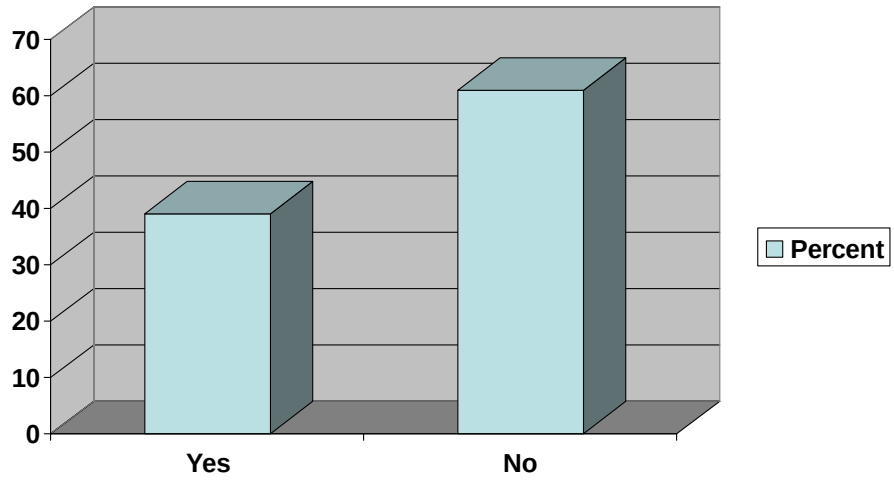
- user focus groups
- provide users with an assignment and after completion evaluate; a. from users results is our online interactive pedagogy clear + coherent b. questionare to users on ease of navigability, retention of lesson, experiences
- We combine open-ended evaluation of ease-of-use, access to information, enjoyment of experience and overall effectiveness with directives to complete targeted tasks.
- Asking representative users to follow scenarios and observing their behavior. (One person interviews, another records.)
- we developed a methodology suitabel fo re-books and e-resources for education under the EBONI project
- think aloud, constructive interaction, extreme evaluation
- Participatory observation, focus groups, artefact-based interviews and evaluation collaboratories
- paper prototyping

6. Who is the typical target of the usability evaluation (e.g. the project manager, the visual designer)?

- Project manager
- Er... the end user of the system... Why would you test a system on the project manager? If you mean, who is it for: then it's for the whole design and development team and the client too.
- Users (museum volunteers)
- Both
- students of computer science, as "educated users" for our algorithms. - Sometimes when we develop software for the general public we ask people we know that have a different background (e.g., our secretary etc)
- Im not sure what "target" means in this question. We use a team design approach and the usability findings are considered by all team members before agrement is reached on changes.
- user
- service of communication and education
- The final users, like professors and museum staff.
- The program content in general (understanding of the information, easy access tothe informacion, quality of the graphics) not a specific person but in my case The Education Department.
- head librarian project manager
- project manager
- The Summer student who does the intepeting and the Administrator.
- The user/visitor audience - not the developers
- curator
- Visiting Public
- The end user.
- The evaluations are made for the entire development team to gain knowledge of how the tools we are developing will/can ACTUALLY be used.
- project manager, visual designer, content designer, navigational designer
- depends on the stage in development during which the evaluation is performed (often the developer/designers but not the project manager). Evaluation targets potential users, not the developers.
- project manager, content provider, and designer
- Not sure what you mean; the public uses the components (they are our target population) and our clients are usually project managers or designers.
- The target audience of the project.
- the designer
- Project manager/visual designer(me) plus interested stakeholders i.e. individual who instigated the development request.
- This question is a bit confusing to me. The typical person responsible for the usability evaluation and implementation of any requirements therein, is of course the Project Manager. However, it is normally the Senior System Analyst and Business Analysts that construct and initially test the usability evaluations. Then the target is the client's stakeholders that are randomly polled to participate.
- designer/programer
- 1. content designer or "author" 2. technical to project technical lead

- Aspects of the usability evaluation effect all key aspects of the project - information design, visual design, development - ultimately managed by the quality assurance or project manager.
- It's unclear what you mean by "target." Usability evaluations are sometimes prompted by the designers themselves, but we always follow up with our own to make sure the design is having the desired effect with our visitors/users.
- project manager
- the customer
- students are our sample users and the feedback goes back to designers
- developers
- The end-user, i.e. all staff, including the project manager
- visual designer
- project manager
- staff and people we invite to try the application out
- interface and graphic designer, content specialists

7. Do you use any software tool or equipment to support the usability evaluation?



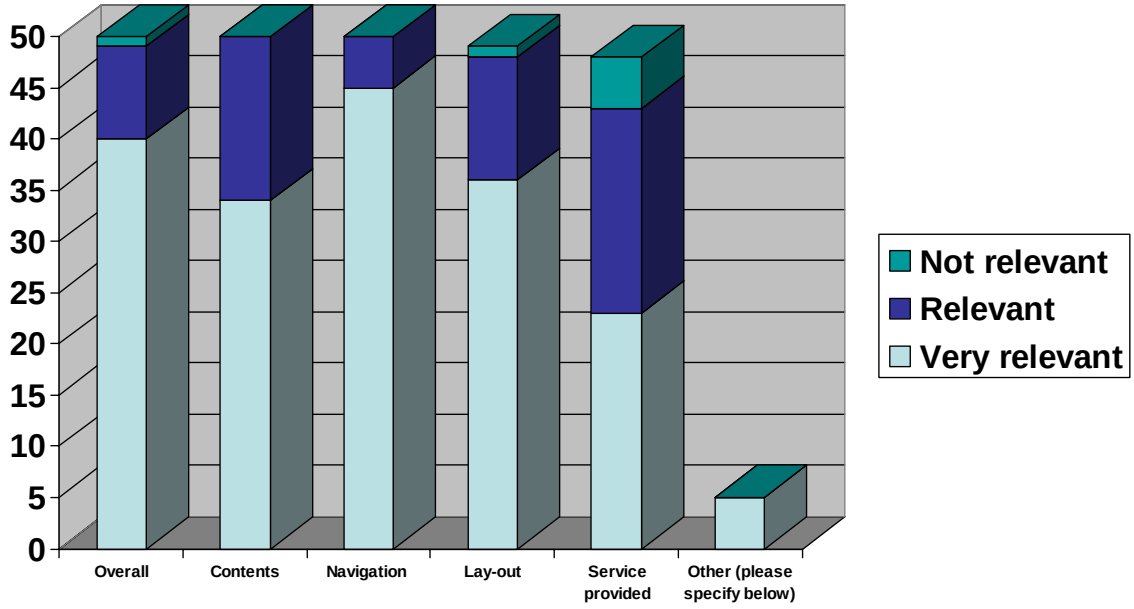
If yes, please describe which one:

- To start we use paper, pens and scissors. Then we use page layouts designed in Adobe Illustrator, which you can use Photoshop Image Ready to put clickable hotspots on and link together.
- For our VLMA project we used bugzilla related tools and were subjected to external software testing according to JISC, our funder, working with EPIC
- if we test, we write our test routines ourselves
- Watchfire WebExact http://webxact.watchfire.com/
- We use a software of screen capture.
- Touch Poll.
- Summary for the weblogs analysis
- IBM card sort tool
- Survey Works
- For one of our tools we developed a usability evaluation tool that allows us to track how our users--in this case experienced engineers--were actually modifying the visualization we were providing them. We are also developing a tool that allows us to gather user feedback as they interact with a cultural heritage application.
- Bobby; UsableNet; Dreamweaver built-in evaluation tools; screen reader technology; eye-movement trackers; others
- do the occassional accessibility test, just to see if there is something we might have missed or didn't consider
- We use JAWS screen reader to support our accessibility evaluation.
- On-line questionnaires, recoredrs and video cameras
- camtasia
- Video and audiotape. Ethnography tool for marking up user statements during the sessions. Follow-up interviews and/questionnaires

PART 2: THE NEXT METHODOLOGY

The purpose of this section is to investigate your opinions about factors and motivations that may prevent or promote the adoption of a new usability evaluation method.

8. How relevant is usability?



Relevant for other aspects:

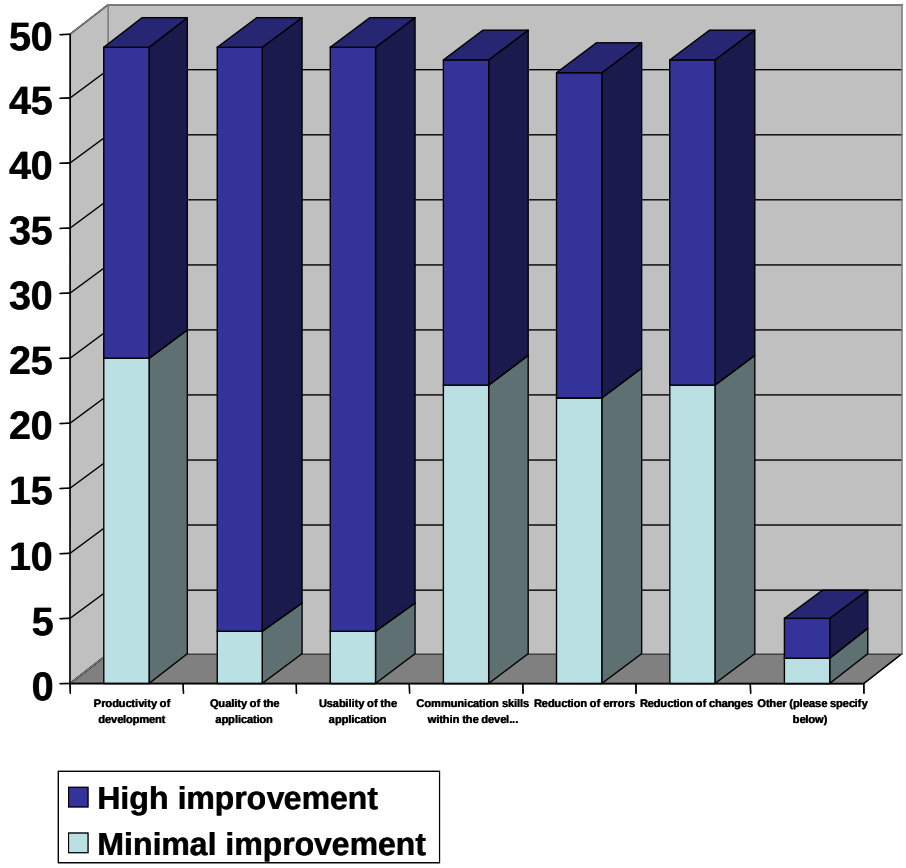
- Graphic design for icons, buttons etc.
- These answers are relevant to the person filling this survey but it has not been relevant to the institution for its website has been neglected for the past 5 years.
- exhibitions
- Interactive feedback components
- bailouts
- Continuous feedback to developers and users

Comments and suggestions

- when designing programs for public audience we look at the games technologies. Games that are not optimally usable simply die out, so we look whether our programs conform to current state of the art in games. - but then we do not do much further usability testing any more. - We think that approach is feasible and what we would really appreciate is a small set of operational design guidelines.
- If a site/service is not understood/unusable by the target audience then it will have been a waste of time developing it. Therefore usabiluity is of prime importance.
- All interactive material, digital or otherwise, is offered in the gallery as an additional service, or one more layer in our exhibition, to our visitors. As such, it is not critical to us how the material is used.

- We find it is very important to examine each usable piece at the end of each day so we can evaluate whether or not to keep using the same piece. If people loose interest in a piece we put that piece away and put out another one.
- Usability results are always relevant. However, often the interpretation is key. Usability guidelines are only valuable in general terms - usability is sometimes culturally and context specific and is not an empirical science.
- Not sure what you mean by services. Conveyance of message is important.
- because web content is dynamic,the interactive narrative constantly changes so does the user's relation to the "story" and as technology upgrades also affect the presentation further iterations beget constant usability testing. budget for it.
- Layout and navigation are not divorced from each other, insofar as the layout contains the affordances that allow users to trigger media or linked screens. These must be clear signifiers to the user.
- Usability has to be the main goal - otherwise why have it available to users?
- For e-books usability is a key factor and all various evaluation studies focus around it
- As for question 4, I would have liked to mark 'both', as I conduct usability evaluation in experimental as well as real live work environments

9. Which improvements and benefits do you expect from a new usability evaluation method?



Improvements on other aspects:

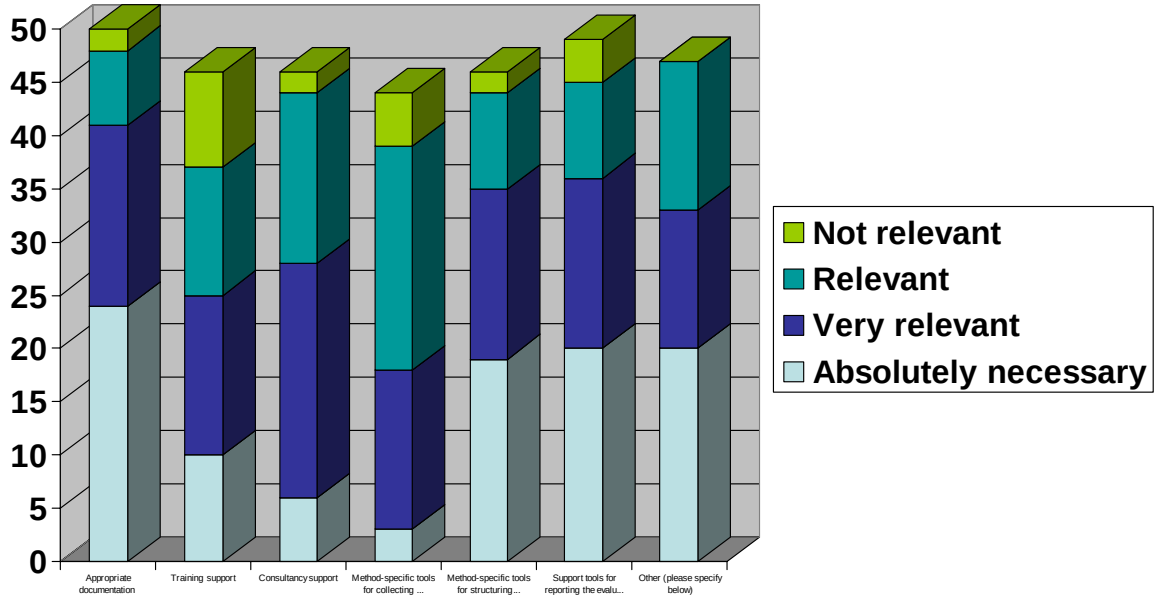
- For us, it would be linked to the RAD prototyping we follow so it would improve speed times to roll out
- Reducaiton in cost
- further market research

Comments and suggestions:

- it would be nice if testing could be automatized (for developers, not for users). Developers test not much because they think that testing is tedious (explain program to each test user again and again)
- I dont know what "quality of the application" means...it is too vague.
- There are enough usability tools and techniques available. What we need are some "absolutes" to guide us in interpreting the results.
- my own multimedia development is a world of niches and, alas there is no standard approach as is found in the static linear world of film post production. The deployment of a web narrative needs constant tweeking. usability is critical.
- Increase of changes: the tests will show you what needs to be changed!
- changes are a maintenance activity that is an on-demand but continuous process.

- It is vital members of the design team are in tune and understand how to run the experiments and how to analyse the findings and interpret them according to original project aims and objectives.

11. If tools for usability evaluation were proposed to you, which features would you consider most relevant?



Other features:

- precise description of the new method
- budgeting for usability

Comments:

- most important is that the results of usability testing are to the point and help me improving my software. Please do not throw tons of statistics at me.
- instructions must be usable by non-experts if all musuems are now expected to have multi-media in order to "satisfy" public demand/interest
- A standard procedure and common benchmarks would be ideal in order to allow a small community like our to progress!

12. How much time do you expect to spend in order to learn and be able to apply a new usability evaluation method?

- I would want it to be intuitive enough to be able to use it straight away. If it wasn't usable, why would I trust the system or the people who developed it in the first place?
- No institution will allow more that a week to receive training.
- A person does not want this to be so complacted that volunteers would have a hard time understanding the evaluation process
- Its hard to specify a length of time. In research a lot of the learning is done "on the fly" as you are trying to solve problems.
- Usually learn as I use.
- A day or two (maximum) would be ideal.
- not applicable since we have none
- we have been designing and running a number of different evaluation studies for e-books for a while so I would not expect anythign drammatically different

13. Which type of training do you find more appropriate in order to learn a usability evaluation method? (e.g. on-line courses, mentoring, practice courses)

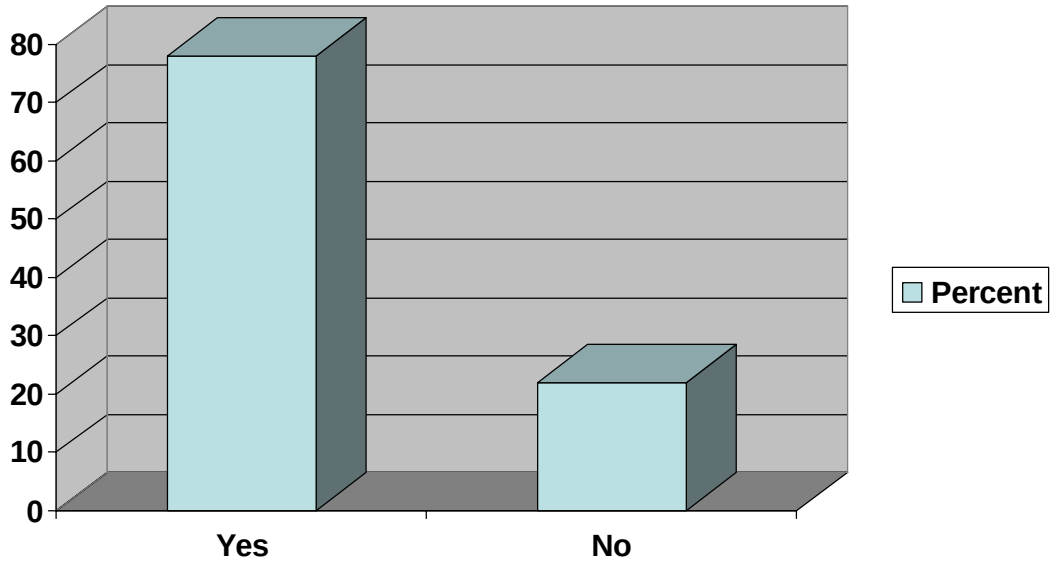
- Having never done this in the past, I would predict practice courses, accessible online.
- on line course
- Using it and seeing what happens. I don't have time for courses. If there was a short paper that explained the technique I would have time to read that. No more.
- Practice courses
- on line courses
- book or on-line course to catch 80%, practice course to get 100%
- quick guides/supporting documentation plus worked examples
- On-line courses (cheaper)
- on-line or practice courses
- Appropriate documentation.
- Practice course.
- on-line courses
- On-line courses are good for the winter months. Mentoring is good when trying to train volunteers and the practice courses are great for staff training
- Actually hands on experience with it, tied to instruction of some kind
- Practice Courses
- By example On-line multimedia exemplars
- -
- Practice courses and online materials for support and review
- on-line courses
- I expect that with good documentation I shouldn't need any training on a product that has good "usability" characteristics!
- all of the above
- not sure
- mentoring
- On-line courses work, as do interactive papers (where 'projects' make up a portion of the reading material. Similar to a school text book.
- reading Web sites, conferences
- on-line courses
- That is dependent upon the individual and their thought patterns. Some learn best by course/theory, others by practical/hands-on sessions. I do not think there is a one best way. I would suggestion online courses as they could be done at an employees pace and when convienent. Perhaps a certification test to verify knowledge retention.
- manual
- our history has been trial by error on our own products
- online courses
- Online tutorials with plentiful visual examples would probably be best, supplemented by presentations (less than an hour) at relevant conferences.
- to learn it, have to see it, hear it and do it several times since the methods would be used sporatically as compared to regular administrative computing
- practice and on-line courses
- practice courses - on-line courses
- WBS
- on-line courses
- demo of the method in use
- Mentoring and practice courses

- on-line courses
- Mentoring
- standard manual and documentation on-line courses
- mentoring and practice courses - more one-on-one work

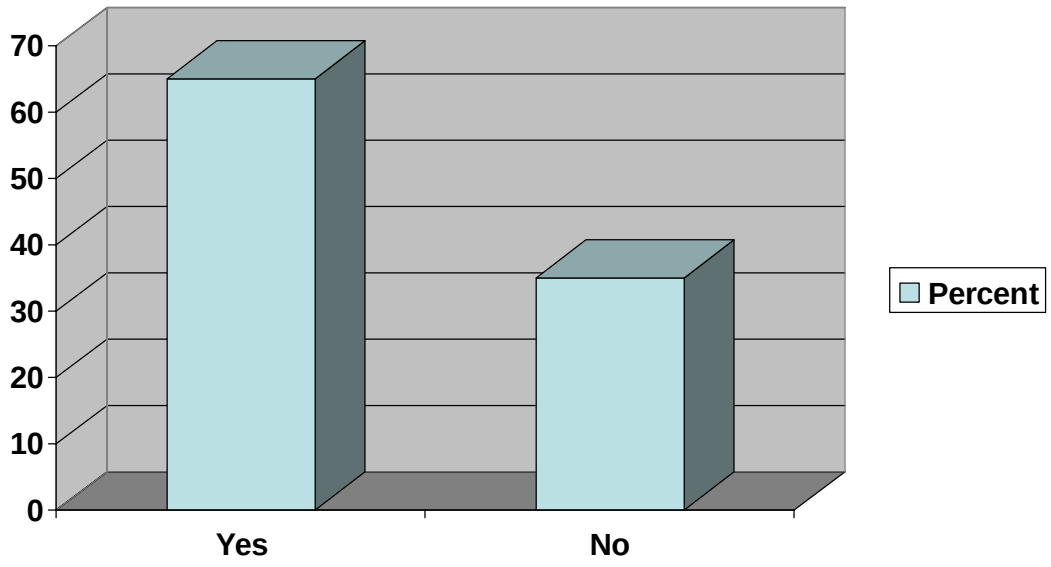
PART 3: ACCESSIBILITY

The purpose of this section is to investigate your opinions and needs about the factors that contribute to the accessibility of a CH application.

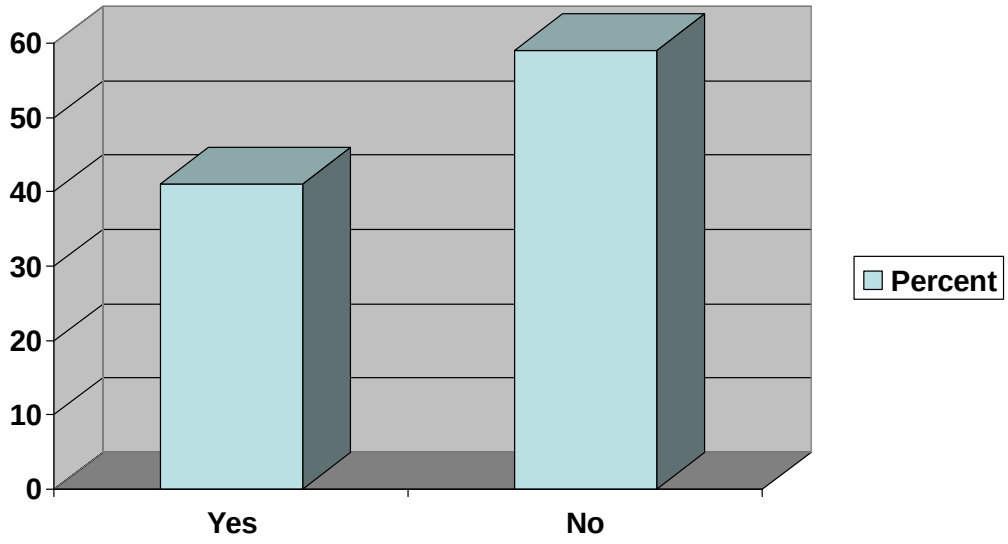
15. Do you know the Web accessibility guidelines provided by W3C?



16. Are you updated about the current research trends in accessibility for interactive applications?



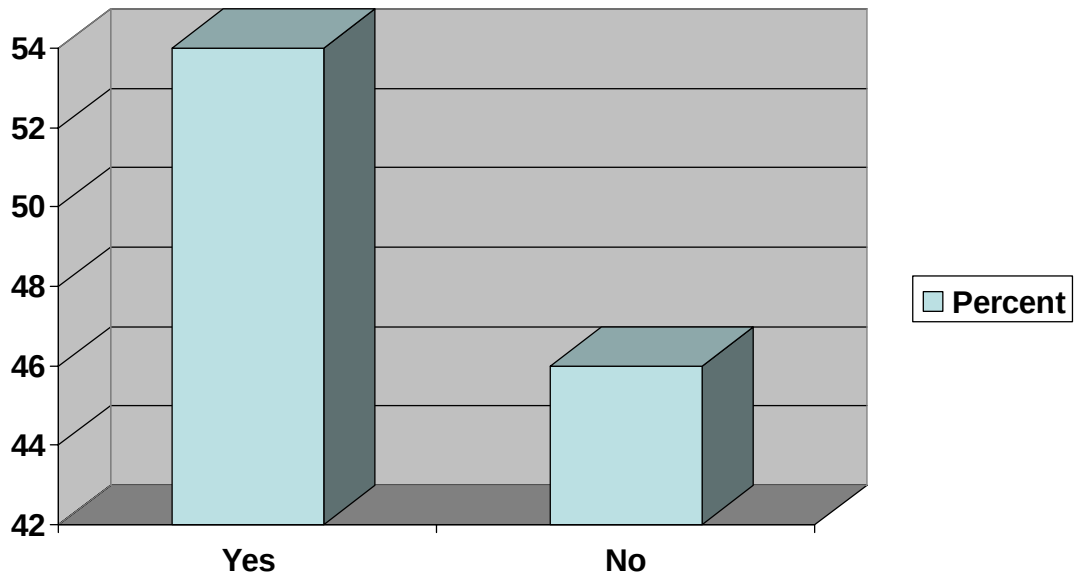
17. Did you ever developed any application considering accessibility issues?



If yes, please describe the case(s).

- We are working on collections digitization projects and are following accessibility standards as best we can.
- Ongoing development of Vernon Browser
- Every website I ever produce from now on.
- VLMA is still in pre-beta stage
- Whenever funding is available through grants.
- We are changing the whole website for that, and specially the audio part we intend to develop for blind people.
- we are not sure. Do you mean blind or physically disabled persons?
- All the applications we develop take into account accessibility requirements.
- Not sure yet
- Yes, but not in the immediate future.
- We are trying to come up with something that is easy for volunteers to use and to understand in Canada
- I have no idea if I will or not - I don't have a crystal ball.
- We are currently developing tools to support museum visits for the visually impaired community.
- See previous response.
- web and interactive CD
- Again, every project we work on we do our very best to consider accessibility.
- The museum's new site
- Youth section on the website, virtual exhibiton space.
- Daily. OPACs for clients. Respecting guidelines, develop interfaces to attact various audience types etc.
- We are looking at redesigning our web site to make it more accessible overall.
- The redesign of the Museum's Web page is taking into consideration acessibility issues.
- I am participating in the development of an evaluation and testbed framework for Daffodil, in connection with Delos wp7.5
- All future projects will consider this important element

18. Are you going to develop any application considering accessibility issues?



19. General comments about the questionnaire.

- I wish more people would conduct surveys like this one!
- very simple and good.
- Why do I have to input "date of compilation"? Couldn|t you simply log the date?
- 1. Some of the questions are ambiguous and/or difficult to interpret. 2. The questionnaire does not distinguish between different aspects of usability, ie. being able to (1) access the site, (2)understand what the site is about (3) navigate the site
- is quite theoretical
- It has been very important for me to participate in this questionnaire for it has provided me with specs that must be taken into consideration when developing a cultural multimedia.
- We do not feel we can respond adequately to this survey due to the limited use and nature of our interactive material.
- This was an excellent questionnaire - very concise and easy to understand.
- I found the questions at times a bit obtuse. A more effective translation might have helped. Was this survey pre-tested? It seems that the ambiguity in some of the open questions (ie does my terminology/jargon match yours?) could have been reduced
- Wording is a bit obtuse. A more in-depth introduction would rectify this. I'm not sure if I am the right audience for this questionnaire
- Great.
- Sounds as if someone is doing marketing research.
- Keep in mind that we are a very small non-profit art gallery, our development team consists of me and curator, or me and art educator, or me and bookkeeper. Testers are gallery volunteers.
- It is a great idea to poll a variety of people as you are doing and those of us who deal with a mulitude of various client types daily are (or should be) concerned with delivery usable IT solutions and anyone creating a repository or standards - kudos to them. It can only help to make Usability more of a science and less of an art.
- valid and relevant to current concerns in multimedia development
- Needs some "maybe" or "in due time" answer options!
- this survey relates to such specialized activity that most museums who will get this survey won't respond becasue they are participants in the technology? Is your intent to know the opinion of only those who have multi-media or the opinion of all museum
- well structured and quick!
- concise and focused

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