Museum and the Internet

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Presenting Cultural Heritage Resources On-line

Selected Papers

from the International Summer Course

in Buşteni, Romania, 20th – 26th of September, 2004

Edited by

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Content

Introduction

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This volume is made up of updated papers presented at the International Summer Course 'Museum and the Internet. Presenting Cultural Heritage Resources On-line', held in Buşteni, Romania, between 20th and 26th of September 2004. The course was organised by CIMEC – Institute for Cultural Memory and supported by the EPOCH Network of Excellence in Processing Open Cultural Heritage (http://www.epoch-net.org). EPOCH is funded by the European Commission under the Community's Sixth Framework Programme, contract no. IST-2002-507382 (2004–2008).

The course was the first of this kind organised in Romania, both at an academic level and at a vocational training level. The programme included lectures, tutorials and practical work in the computer lab, students' projects presentations and debates. The participants were museum directors, professionals working in archaeological parks, students, curators and technical personnel, in charge of computer applications in their institutions.

Why this course?

During the last years many museums have developed websites either on their initiative or following the suggestions of another organisation. Nevertheless few museums are aware of the impact of their web presence. Many existing museum websites are not updated regularly. There seems to be insufficient knowledge on how to present museum collections and other cultural heritage resources on the Internet in an intelligent and meaningful way. Especially small and medium size museums and heritage organisations with limited staff and low budgets are the victims of the digital divide. They lack both skills and technical assistance to develop web pages, to integrate in networks and larger heritage projects. Often large museums do not know how to use the potential of the new information and communication technology too.

The course organised by CIMEC wanted to offer a general overview of the experience gathered in various Romanian and European projects in presenting museum and cultural heritage resources on the Internet; problems and solutions of web access, finding information and attracting visitors for enjoyment and learning; and basic training in selecting the material, designing the Web content for cultural heritage resources, addressing various audience groups and maintaining digital resources on cultural heritage. It also aimed at stimulating the use of new technologies in cultural heritage institutions in Central and Eastern Europe, overcome fragmentation and encourage people to network at national, regional and European level.

Participants

The course targeted mainly museum curators, museum directors, archaeologists and heritage staff with basic knowledge of both computer use and English (the official language of the course). The course was published on the web sites of the Epoch NoE and CIMEC (*Fig. 1*), and announced through mailing lists (muzee@cimec.ro and arheologie@cimec.ro). Personal contacts were made by the organizers of the course from CIMEC, by phone and e-mails to a large number of museums in Romania and abroad, in order to reach the potential applicants.
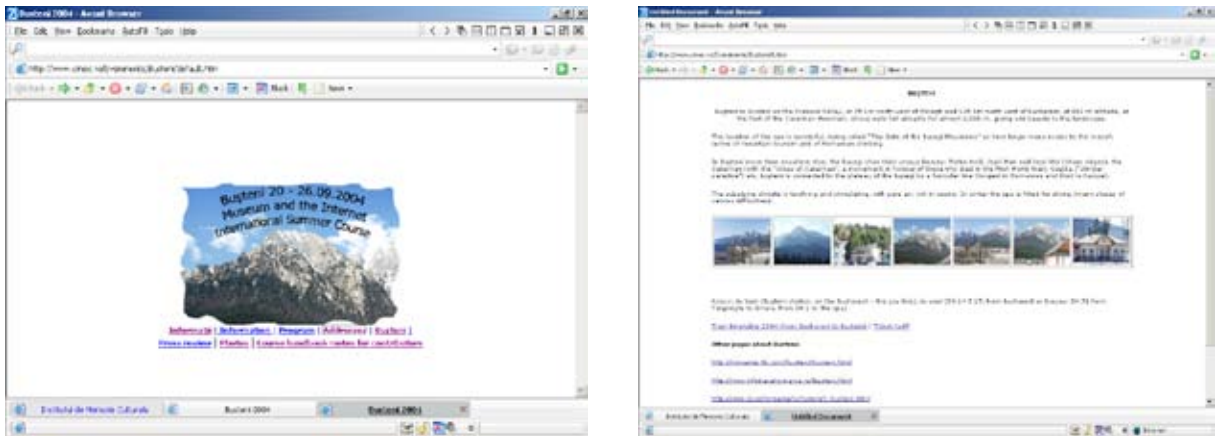
Fig. 1. Web site of the course

Web site of the course

Preliminary information was published on the Internet, on the web site of CIMEC (http://www.cimec. ro/Evenimente/Busteni/default.htm) and through a link on the web site of EPOCH. Applications were made via the Internet which guarantees that the participants are familiar with the digital medium. After a selection made by the Epoch bursaries committee in accordance with the Romanian organizers, we admitted 27 solicitors (19 from Romania, one Greek, three Bulgarians, one Finnish, one Croatian, and two Israelis). The seven speakers came from Italy (2), Norway (1), England (recorded speech) and Romania (3). Students were invited to present their work in special sessions, entitled 'Our projects'.

The place

The lectures and practical work took place at Buşteni, a small resort in the Carpathians Mountains, in a training centre, where a computer room and a lecture room, both with Internet connection, provided the entire necessary environment for holding the course (*Fig. 2, 3, 4*). Coffee breaks and lunches were taken at the same centre, which proved to be a good solution, participants continuing discussions during these breaks. The accommodation was provided in a small hotel nearby, which aided to the cohesion of the group. The fact that the course was held in a small town, but nevertheless well connected to all major cities in Romania and close to several international airports, reduced the costs of the course drastically.

Fig. 2. Hotel in Buşteni

Fig. 3. Opening of the course

Fig. 4. During the course   *Fig. 5. Looking at the heritage around*

The programme

The first half of the day was devoted to lectures and demonstrations, followed by a discussion and after lunch a tutorial was held, related to the subject presented in the morning. In this way, both the theoretical and the practical aspects of the discussed subjects were covered during the course. All invited speakers participated daily at the whole programme of the day, assisting their colleagues and thus creating a stimulating and warm environment for everybody. We also organized visits in the area, at Peleş Castle and Sinaia Monastery (*Fig. 5*). At the end of the course the participants received certificates.

Course Handbook and after

We consider that the course was successful. In the period following the end of the course, several new museum websites were created with the contribution of course attendees: for instance, the websites of the Lower Danube Museum in Călăraşi (http://www.mdjcalarasi.ro) and 'Vasile Pârvan' Museum in Bârlad (http://www.muzeuparvan.ro). The number of Romanian museum websites increased significantly, to 238 by the end of 2007. The links to museum websites can be accessed through the 'Museum in Romania on the Web' web page maintained by CIMEC as part of the Virtual Library Museum Pages, an official catalogue of ICOM (http://www.cimec.ro/Muzee/VLMP/defaulte.htm). VLMP was initiated by Prof. Jonathan Bowen. That trend of a growing Romanian museum presence on the Internet cannot be attributed to our course entirely, but the spread of the word by participants and father dissemination and assistance offered by CIMEC played its part.

The lectures and the short presentations of students, revised and updated by their authors in 2007, to keep the path with the fast changing technological environment, are published here. An electronic version is available on the websites of both EPOCH NoE and CIMEC. The Web site will continue to keep the group informed and facilitate future collaboration.

In 2005 we organised a second course, 'European Cultural Landscapes: An Interdisciplinary Approach', an international course held again in Buşteni (9th – 15th of May 2005), organised by CIMEC – Institute for Cultural Memory, with the support of the EPOCH NoE and the European project 'European Landscapes: Past, Present and Future' (Culture 2000 Programme, 2004–2007).

The second course focused on aerial photography and GIS in archaeology (the website of the course at http://www.cimec.ro/Evenimente/Busteni2005/index.html). Both courses contributed to educate heritage professionals in using new technologies in their daily work.

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Museum Websites

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The Beginnings

Most museums started their virtual life on the Internet with an electronic leaflet: one or two linear text pages with basic information and a few images. Often the content was taken as such from printed leaflets of the museum. The possibility of frequent information updating was ignored by most, following the same mental pattern of pre-digital age: what is printed cannot be changed until the next edition, that is, for years. Few thought of producing something suitable for screen reading. Nobody addressed to a public different than that visiting museum physical exhibitions. The unique, meaningful and stable web address was not regarded as important. Web addresses changed from time to time, adding to the confusion of their potential users.

Many museums are still in this early stage of their web presence. For others, the advance of new technologies combined with specific curators' skills to design exhibitions lead to innovation in developing nice-looking, dynamic and spectacular web pages. Starting with 1998–1999, in parallel with a fast growing number of museums and other heritage institutions having their own websites, we saw a new generation of museum websites: richer, more attractive and efficient. To have a website address and an e-mail address became mandatory for any honourable organisation.

Virtual Library Museum Pages (VLmp)

When Jonathan Bowen had the idea to gather links to museum websites back in 1994, the Internet was yet unknown and unused for a large part of the world, museums included. The Virtual Library museums pages (VLmp) were first established as part of the Virtual Library (http://www.vlib.org). VLmp provides a directory of museums that have their own associated website, organized and maintained by country. The directory grew rapidly into a significant repository for use by the general public and museum professionals alike, allowing convenient and up-to-date access to global online museum information.

In 1996, through the encouragement of Cary Karp (based at the Swedish Museum of Natural History in Stockholm, Sweden), the International Council of Museums (ICOM) adopted VLmp as their main online museum directory. ICOM allowed the directory and its various mirror sites around the world to be included on its main website (http://icom.museum/vlmp).

Given the number of museums around the world, VLmp could no more be maintained by a single person. Thus, the directory has been split by country, with individual maintainers for each country when available. The Canadian Heritage Information Network (CHIN) was the first to offer to maintain such a list for Canada and have been exemplary in their provision of support for museums online within that country (http://icom.museum/vlmp/canada.html). Within the United Kingdom, the MDA (Museum Documentation Association) have adopted and then maintained the UK section of the directory (http://icom.museum/vlmp/uk.html). A significant number of countries and continents now have separate lists as part of VLmp, often with information pages in the local language as well as English. Today there is more and more difficult to keep the directory updated even at country level: links become obsolete, new websites appear, and the software tools need to keep the path with technological changes and user needs [Bowen 1997]. The instability of the web addresses was one of the greatest problems on the Internet. We had to learn to keep traces of our movements on the web.

Since 1997, CIMEC – The Institute for Cultural Memory have administrated the VLmp for Romania. The number of Romanian museum websites grew from a few (under 20 at the beginning of the directory) to over 240 at present. That means ten times more museum websites over a period of only ten years (http://www.cimec.ro/Muzee/VLMP/DEFAULTR.HTM). The directory is updated regularly (*Fig. 1*).

The history of VLmp reflects the evolution of the Internet during the last fifteen years and the rapid changes of the way we communicate. There have been over six million virtual visitors to the VLmp homepage. Although many museum websites are not included in this directory, it is a very useful tool to globally find information on museums.

The basic rules for writing for the web

Many museum websites started as HTML files. The content had to be structured and written in a different manner than the traditional publication taking into consideration the limits of the computer screen but also the advantages of easily jumping from one page to other using hyperlinks. The technique of writing for the web emerged as a necessity and had a major influence on scientific writing in general. It must take into consideration specific features:

• Content should be written in a structured manner, in chapters and subchapters, numbered or not. Chapters may be read also independently, from a browser or link, which implies they should be well structured.

• Usage of titles and subtitles to guide through the content; more frequent usage of literary, attractive, interesting or sometimes humoristic expressions and question titles attract the virtual reader.

• Photographs, maps, plans, drawings must have a low resolution (from a few K to 150 K) in order to be able to open quickly on the user's screen. The image files must have a jpg or gif compression formats. This way the reader has a quick access to the illustrations. This rule is still valid despite the spread of broad-band connections. On the other side, our selection of images does not follow the same space restriction specific to paper publication. We can add many images. The only limit is the time of the readers therefore proper selection and relevance is important.

Fig. 1.

- The footnotes or endnotes can be indicated by hyperlinks. The text references on the Internet can be made by a hyperlink to the webpage.
- The digital environment makes it possible to easily add sound and video files: author's comments, interviews with him or with others, video records from events, sounds from nature, noises produced by mechanisms and equipment, musical background, movies, etc. 3D reconstructions and animation contribute to understanding and enjoyment.

With the advance of web technologies and growing connection speed, the static pages can be replaced by more dynamic ones, using frames, menus, animated images and more sophisticated design. For large websites, a better solution is to use a content management system (CMS) software which assures the coherence, updating and maintenance of the website by providing storage, maintenance and retrieval of HTML and XML documents and all related image, audio and video files. It may include or accept plugins that provide banner advertising, shopping carts, blogs, wikis, newsletters, opinion polls, chat rooms and forums. Such systems may be able to publish not only to a Web site, but to a CD/DVD or print as well. Some of them are free (Joombla!, for example, a popular open source content management system to create and manage websites, see www.joombla.com). The website is the work of a team including webmaster, web designer, editors and content providers.

In museums, this new medium of communication changed the very structure of the organisation. It started as another publication in digital format, like CDs, to become a significant part of museum activity including online collections catalogue, virtual exhibitions, educational pages and interactive dialogue with the public.

Museums must acquire a permanent domain name for their web address and include funding for the website maintenance and development in their annual budget. ICOM offers museums better visibility on the web through the *.museum* top-level domain. The Museum Domain Management Association – MuseDoma – is responsible for the policies and operation of the **.museum** top-level domain (http://musedoma.museum/ and http://about.museum/).

Guide for Museum Web Pages

What means a good website? To help museums develop their web presence and avoid mistakes, a group of professionals developed a guide for museum websites. The Museo&Web project 'Planning Kit for a Quality Site for Small and Medium Sized Museums' (*Fig. 2*) was developed under the Minerva European Project, a thematic network in the area of cultural, scientific information and scholarly content (http://www.minervaeurope.org/home.htm). Museum&Web guide (Museo&Web 2005) is organised into four parts:

- **Structure and Contents of the Prototype**: this contains indications for organisation of the contents and services, in addition to numerous examples of both Italian and foreign sites;
- **Tutorial**: this offers suggestions for construction of Web pages according to the rules of accessibility and usability and gives practical information on architecture, management, inter-operability, copyright, multilingualism etc.;
- **Quality Control**: this gives practical tools for evaluating the applicability to the specific web site to be created;
- **Models***: there are three downloadable models: a home page, two other pages of a site and their templates.

Museo&Web offers an almost complete website content list for beginners, insisting on the hierarchical hypertext structure: the home page leads to pages on second, third and fourth levels and so on:
Homepage

- ◦ A (first level)
  - • A1 (second level)
  - • A2 (second level)
- ◦ B (first level)
- ◦ C (first level)
  - • C1 (second level)
    - • C1.1 (third level)
  - • C2 (second level)
    - • C2.1 (third level)

Recommended website main chapters and subchapters are, in short, the following:

- • **Homepage**: contains a synthetic summary of the aims, contents and the organisation responsible for running the site.
- • **Museum location**: address and telephone numbers; how to reach it (street maps, public transport); the museum in the territory; the museum in the city; about the building; map of the rooms.
- • **History**: describe the history of the institution, the history of the building in which it is housed, the formation of the collections that are conserved within it and changes it has undergone (acquisitions and events, former directors).
- • **Activities:** this includes activities for the public (exhibitions, guided tours, educational projects, publications, conferences and events of various types); activities aimed at the care of the collections (restoration, cataloguing, programmed events, acquisitions and loans); activities of research (studies on the collections and materials, participation in scientific congresses etc.).
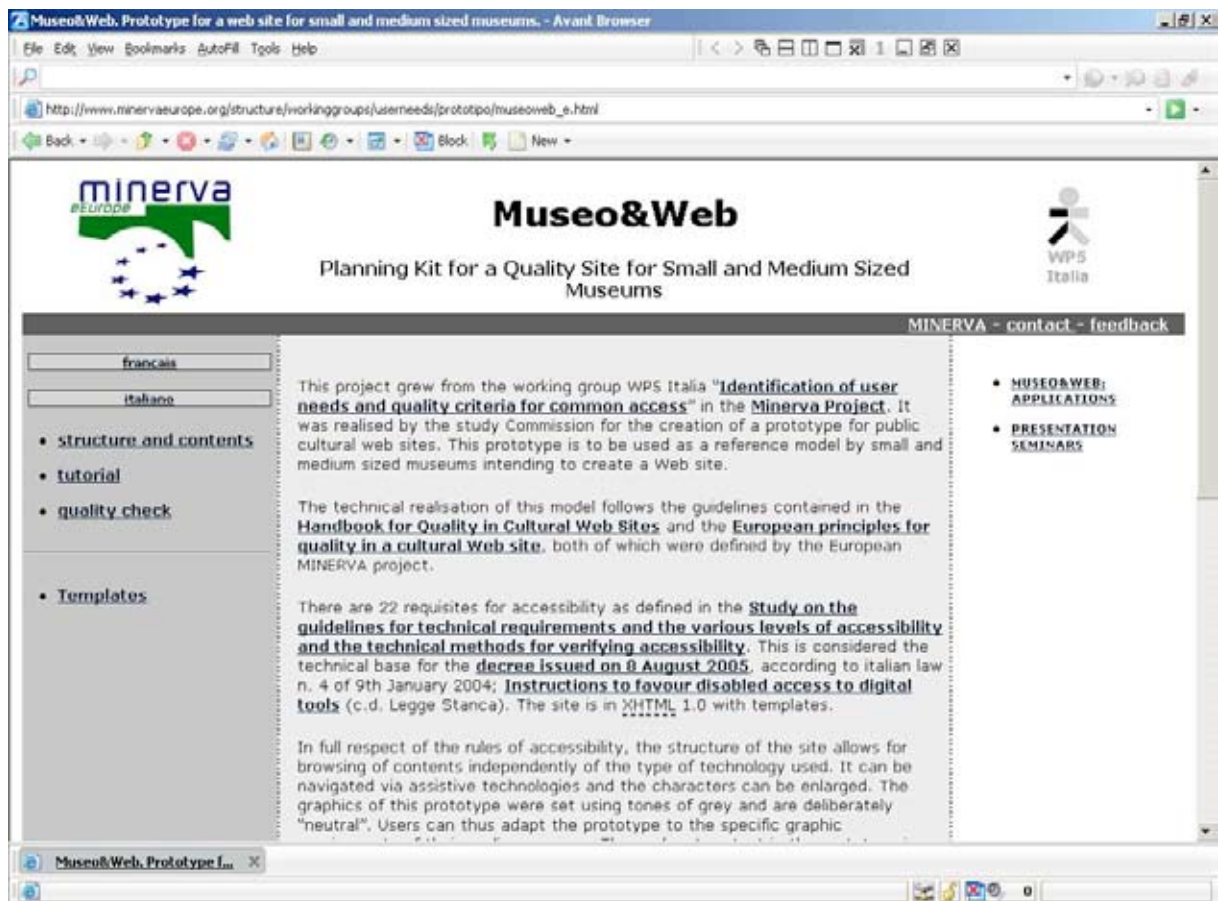

Fig. 2.

- **Research:** study and research projects, seminars and conferences run and promoted directly by the museum.
- **Collections**: name and type of collections, brief description, highlights, on-line catalogue.
- **Acquisitions**: list of the museum's new acquisitions, with date and brief notes.
- **Restoration**: laboratories and the conservation activities run and promoted by the museum.
- **Publications:** a list of scientific publications, guides, journals, booklets and articles.
- **Exhibitions**: which exhibitions are current, which concluded, and which programmed for the future.
- **Educational projects**: the educational activities offered by the museum, such as guided tours, educational laboratories and workshops. Projects will be differentiated according to age of target users and/or the route of the tour. Where possible, audio-visual and other support materials should be available on-line.
- **Opening Times**: opening times to the public of the museum and other connected structures such as libraries, bookshop and café. It should also include a list of closing dates for holidays.
- **Who we are**: scientific, technical and administrative personnel, the structure of the institution, organisation/offices.
- **Routes**: educational routes to help understanding the heritage conserved in the museum. Routes can be organised thematically, in chronological order and/or by level of scholastic depth.
- **Services**: give information on the welcome structures within the museum and on services to the public: library, archives, bookshop, conferences room and other resources.
- **Community**: Specific contents and services should be created for all the categories of public and various means of interaction with users could also instituted, such as, for example: newsletter, discussion groups, forum, associations and other organizations.

Each museum can use this guide to develop a website, to check its current website and find ideas to improve it. The content will depend on the profile of each institution, territorial coverage and resources.

Another recommendation regards features for navigation and networking. The website must include buttons for typical elements of meta-navigation:
- **Home:** indicates link to the Home page;
- **Search:** link to search engines to find specific contents within the site;
- **Site Map:** indicates the layout of the site and all its directories;
- **Guide:** contains general information on the site and how to use it;
- **Contact:** allows quick contact with the site organisers;
- **Feedback:** this usually opens a form where the user can send comments and technical suggestions related to content. (http://www.minervaeurope.org/structure/workinggroups/userneeds/prototipo/protomuseo/strutturacontenuti_e.html)

A quality website must be:
- Always on-line and active;
- Adequately monitored ;
- Constantly improved;
- Constantly updated with regular checks that the links are operative;
- It should interact with users.
- It is advisable to monitor statistics of access to the site.

Museum Collections On-line

The Web developed beyond imagination in just a couple of years, as a huge digital archive as well as a publishing medium. It benefits of more and more sophisticated software tools, fast connections and

computer availability. *'The network has become a repository of collective private and social memories that could be recorded, catalogued and retrieved by everybody with a computer and a network connection'* [Numerico & Bowen 2006].

Museums and other memory institutions have a lot to offer for education, scientific research and enjoyment in this new medium. Why not establish virtual museums and electronic libraries online, available anytime, from anywhere, for anybody? From the 'highlights of collections' – a few well known items exhibited on the web site of the museum with an image and a brief description, so often found in the early years of the web, to the idea of entire on-line inventories, catalogues, full-text books and documents the jump was quick and spectacular. Heritage collections published on-line and digital libraries became a reality after the large-scale adoption of computers and the advancement of people's computer skills. At national or institutional level, databases for museum collections, sites and monuments or visual archives could be put on-line with search facilities, access indexes and more and more ways to discover what you are looking for. On-line museum collections catalogue is more a matter of policy than of technology nowadays. Where policy encourages large scale digitisation and access, we see wonderful resources available for learning, study and public curiosity: for example, Fitzwilliam Museum in Cambridge, UK (*Fig. 3*, www.fitzmuseum.cam.ac.uk/collections/); Tate Museum in London, UK (http://www.tate.org.uk/); Musée du Quai Branly in Paris, France, (http://www.quaibranly.fr/fr/collections/les-catalogues-des-collections/index.html); Musée McCord d'Histoire Canadienne**,** Montreal, http://www.musee-mccord.qc.ca/fr/clefs/collections/;Te Papa Museum of New Zeeland, Wellington, http://www.tepapa.govt.nz/TePapa/English/CollectionsAndResearch/, to name just a few.

Part of the museum community has been reluctant to give too much information online. Many people and institutions expressed worries that information available on the web will reduce the number of visitors of the physical museum and the selling of books and catalogues. This anxiety did not entirely disappear but the new medium proved in most cases favourable for the visibility, attractivity and educational role of museums.

Large institutions usually have both human and financial resources to develop costly long-term projects. Small and medium-size museums often have not. For them the better solution is to join national networks and spare resources in a collective enterprise. National portals and thematic networks developed around the globe. In Canada, for instance, the Virtual Museum of Canada (http://www.virtualmuseum.ca) networked Canadian museums and enjoy more than 7 million visitors each year for an Image Gallery that features over 420,000 images, more than 150 interactive games and 500 virtual exhibits.

Since 1996, the annual conferences 'Museums and the Web', organised by Archives & Museums Informatics (http://www.archimuse.com/conferences/mw.html) are a prestigious forum to promote innovative ways of museum contribution to the WWW.
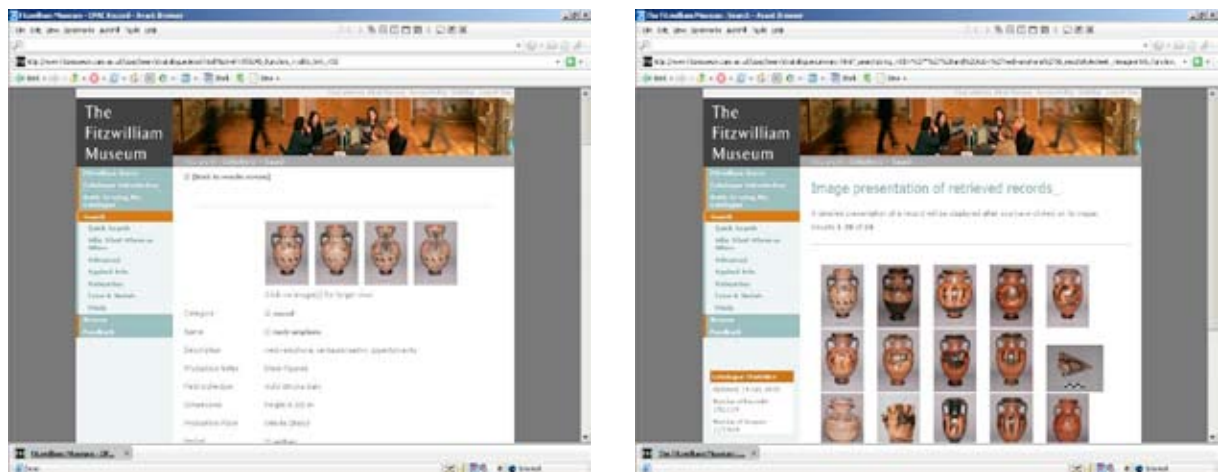

Fig. 3. The Fitzwilliam Museum Collections online

In Romania, the Institute for Cultural Memory (CIMEC), a national organisation created in 1978 for the computerised inventory of the national cultural heritage, opened its website in May 1996. The first on-line databases were available on its website (http://www.cimec.ro). In just a couple of years, there are 18 on-line databases with over 100,000 records.

Museums and the Advance of the Web

While many institutions do not find yet their way on the Internet, the more advanced entered a new stage of communicating over the Net with the more interactive tools offered by the so-called Web 2.0: news feed, social networks, photo and video sharing, on-line journals (blogs), personalised access and feedback from the public. The visitor is not only an observer but also a contributor and it get the instruments to participate easily and cheaply:

'When we begin to share our experiences of exhibited artifacts with other people on the Internet, we are producing for public use. For instance, we may write about an exhibition on our weblog; post photos about The Last Supper on Flickr.com (http://www.flickr.com/photos/bwop/133033678/); or add to a Wikipedia article. The technologies make this type of public sharing possible, are often referred to as Web 2.0.' [Mutanen 2006]

What will Web 3.0 bring in the next ten years for museums?

'Where Web 1.0 was a "read-only" web, with content being produced by and large by the organizations backing any given site, and Web 2.0 was an extension into the "read-write" web that engaged users in an active role, Web 3.0 could extend this one step further by allowing people to modify the site or resource itself.' (http://en.wikipedia.org/wiki/Web_3)

How will museums and other specialised institutions keep their intellectual authority role? A cleverer web will better predict, understand and answer user' needs. It also should make a clear distinction between professional and amateur contributions on any given topic.

Internet communication is a new activity of museums. It will determine organisational changes and capabilities to adapt to fast technological development. It will lead to new language and new communication techniques. How long it will take to spread the use of new technologies in the most remote, reluctant and conservative circles of museum community? The sooner, the better.

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How to Manage a Small, Medium-scale Internet Project?

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The aim of this paper is to present the method and technique we used for developing and managing the Jerusalem Archaeological Park Website Project (www.archpark.org.il).

The project was initiated by the Israel Antiquities Authority four years ago. The advisory committee of the website consisted of prominent archaeologists and scholars, and was headed by Prof. Ronni Reich, director of the City of David and Robinson's Arch excavations.

Hundreds of archaeological research projects in Jerusalem have left us with a lot of information that occupies numerous bookshelves in libraries and archives. The information includes maps, illustrations and drawings, some of which were published in books, each dealing with a different aspect of the city and usually divided into periods and/or topics (for example, burial habits or the city's fortifications). The objective of the Jerusalem Archaeological Park Website Project is to present all the known information about the city in a friendly format and nice GUI (Graphic User Interface). The information in the website is displayed according to periods and topics.

The website's content is backed up with historical sources and bibliographies, classified by periods and topics. Its advantage lies in the unlimited information that can be displayed, including texts, images videos etc., as well as the ability of linking very easily between all the website's content.

The Jerusalem Archaeological Park Website was launched as part of a much bigger educational project, whose keystone is *the Davidson Exhibition and Virtual Reconstruction Center*, near the Dung Gate in the old city of Jerusalem (better known as the Temple Mount Excavations). The occurrence of the Second Temple period ruins in the area was the reason why we chose to deal with it as a starting point for the website's content. The purpose was to show the most updated information in a digital way, using the media's advantages of internal and external links to historical sources, biographies of historical excavators and prominent scholars. A large bibliography, divided into topics, was also added and the site's glossary was updated as well.

The nature of archaeology is dealing with artifacts and relics.

At a certain stage we figured that the site does not include an area dedicated to showing artifacts. In contradiction to the topics as architecture and ornamentation, building remains, walls and fortifications, the exhibition of artifacts is global and laconic.

It became clear that the navigation of the site didn't take into consideration the presentation of artifacts and assemblages. Therefore, we had to develop a mechanism, slightly different from all other site's sections. In the next stage of the project, we are focusing on the development of a module that will enable us to show a series of artifacts that mirror the archaeology and history of the city of Jerusalem.

'Fifty ways to leave your lover' (Paul Simon) or to create a website…

Most of us would think that a website of a public organization / museum (cultural institute) is an easy task to achieve: Just collect the information that the organization wishes to display on the website, add some colour, create a few static HTML pages and launch it into the web. Although this is quite a simple and fast way to 'be there' – the disadvantages of working 'simple' and 'fast' are numerous, i.e., updating the content is a difficult mission and requires special skills, adding new content cannot be done by the organization, etc.

This paper aims to provide some basic tools and skills required for **developing** a small, medium-scale Internet project.

1. Ask yourself what is the aim of a website for the organization.

Everybody knows that it is important to be 'there' so as to 'be found'. Yet 'to be found' is neither a goal nor a project's objective. It is a byproduct of using the Internet as a media of content publication / distribution.

The aim of a website should be sharing information about the organization and its work.

2. Do some research – surf the web and learn from similar / competitive websites.

The web has a lot of information to offer. Use it!
Someone around the world has most probably developed already something similar.
Surfing the web enables you:
a. Learn what has been done / can be done.
b. Know your competitors' work.
c. Gain from other people's mistakes.
d. See how people managed to overcome difficulties similar to yours (like language).

3. Share the gathered information with colleagues

This stage is crucial for the success of the organization's website. Although a website has one 'website-manager', a lot of people within the organization are also involved. Therefore, it is extremely important to share information with them, listen to their ideas and divide the work needed to be done. Try to find a group of representatives from the organization's different departments and create a 'brainstorming' meeting where everybody gets to present his department's needs from the website. At the same meeting, you should also put forward how he/she will contribute to the website during its various stages of development (content).

4. Prepare a 'requirements' paper

The paper should include:
• The content you would like to display in the website
• The way you would prefer to manage (change/add/delete) content; Remember: a website should be 'alive'!
• What are the professional skills required for developing the website (designer / developer, etc...)
• Who should be internally part of the project? Who will lead the project, who will write and contribute to the content, etc.?
• Who will manage the website after its initial launch?
• Assimilation within the organization
• Should new equipment be bought for the project, e.g., scanner, digital camera? Is the organization connected to the Internet?
• How long should the development take? Do you have one year for getting the website up and running as one big project or will the website be launched using the 'salami method' i.e., think initially about

the whole project, but launch it piece by piece. Try using a 'Gant chart', write down all the requirements needed to be done according to their stage in the project, and how much time is spent on each and every assignment. Do not forget to write, next to each assignment, which is responsible for completing it. Keep in mind that several assignments can be done simultaneously, thus sparing time. The most important thing to remember is that 'Time is Money', and somehow, neither is plentiful!

- Plan your budget carefully. As soon as you know how much effort and time is required to complete the project, try to set up a realistic budget, which should include all the hours for both internal and external human resources, as well as for content management.

5. Send out a RFP (Request for Proposal)

After completing the internal requirements paper, you should be able to send out a RFP to companies dealing with development of Internet websites. The RFP should include the vision, the needs, the project's timeframe, concerns (if the website also includes Slavonic texts, how does the company deal with the Cyrillic signs?), recommendations about previous works, and a final date for sending back the proposals.

Don't forget to add an e-mail address / phone number for questions to the RFP! Usually an end date is also set for sending-in questions. The answers are usually given until a certain date (so the company has enough time to use the new information and keep within the timeframe for sending back the RFP).

Another option other than the direct communication via e-mail or phone, can be a vendors meeting, whose aim is to answer all the acquired questions at once. Try to be as specific as possible and give as much information as needed; at the same time, write the RFP document in such a way that the companies relying to it have enough space to share with you their ideas about the development and maybe suggest new ideas. Remember that this is their expertise so let them lead you to the best solution they can offer!

The desired result is a paper, in which the competing companies declare:

- Their vision about the requests, including how they intend to take your 'dreams' and transform them into a website.
- The technology they are going to use.
- If it is a database-driven website, what database will be used; how can the website expand in later stages when needed and what will be the cost and the effort?
- Provide a 'Gant chart'.
- Prices (including maintenance).
- Process for future development.
- Recommendations and previous work examples.
- Additional comments.

We would suggest preparing a table with all the needed information for the companies to fill in. It will facilitate the process of comparing between the different offers.

6. Developing a website

Step 1: Brainstorming
After choosing the company / people you are going to work with on this project, brainstorming session(s) should take place. These meetings' aim is to point out all the project's requirements and make sure that all sides share exactly the same information. This stage is crucial because upon the information shared during those sessions, the company will prepare the specification paper for the project.

You may begin by collecting the illustrations, photographs, etc… you wish to use for the website's design.

Step 2: Specification paper
This task should be completed by the company that was chosen to develop the website. The specification paper should include at least the following items:
1. Technology used for the development.
2. Database driven?
3. Modules included in the website.
4. Languages of the website.
5. Exact description of each and every module with a simple scheme of how the page is displayed (not design, just content).
6. If the website is database driven, how will the back office for content management look like for each and every module?

The specification paper should then be reviewed and accepted. It is important to receive such a paper and review it carefully, since this should be the only reference paper for development (for developers, designers and content managers). It should be the exact description of how the website looks and what tools will be used. The specification paper should not include what content will be added to each module; it should definitely contain what *type* of content will be displayed.

Step 3: Development
At this stage, the developers use the accepted specification paper as their sole reference for the development of the website.
This step can take a while (depending on the complexity of the website), although the time spent is known in advance (due to the Gant chart). The person responsible for the website's content should use this time to start collecting and rewriting (if needed) the website's content. That person should also use the specification paper as a reference for the required information (e.g., module 'about us' has only one picture, but module 'museum departments' has five pictures for each department).

Step 4: Design
The designer should receive a wide-scale explanation about the organization's expectations regarding the design. The results should be two different designs.
To get the best results, you should prepare before meeting the designer:
• look for websites you like (not necessarily from the same discipline)
• look for websites you dislike (not necessarily from the same discipline)
• Try to gather materials the designer can use (photographs, images, logo)
• If the organization has its own font for stationary, collect some examples.

Remember that this step is the only 'subjective' stage of the project, since every person has its own perspective about 'nice' and 'pretty'. To prevent this stage from becoming a 'never ending story', define a priori who will participate in the design stage.

Step 5: Integration
Integration between the website code and design.

Step 6: Quality Assurance (QA)

Poor QA can result in a troubled website. It is highly recommended to invest the necessary time and effort in the QA. This stage includes the elements that can make the difference between a successful website, or a website which will be surfed for less than 30 seconds will never be visited.

Step 7: Launch

Congratulations! Your website is online!

Step 8: Publish your website

Being online without making some 'positive noise' about it, is like writing the most beautiful music and playing it just for you behind closed doors. It is crucial to publish the website, if possible through the Internet, but also via other media (newspaper, radio). The internet allows you to publish the website within search engines (some are free of charge, others demand a fee), using the meta-tags. Another option is to design a banner that promotes it and links to the website.

Step 9: Ongoing Content Management

Since we all agree that a website whose content is static and doesn't change is bound become boring very soon. It is essential to appoint a person within the organization who is responsible for updating the website's content and adding to it on a regular basis.

Step 10: Additional developments

Since no one can predict the future, don't be surprised if after a while the organization feels the need to do some additional development work on the website, especially if the chosen way of work was the 'salami method'. It is important to remember that although this is an additional development, should not be forgotten.

   Developing a website is an effort-driven task which demands cooperation between several people with different skills. Good communication and defined tasks are the keys to a successful and economical completion of the project. Good luck!

How Can You Create a Web Project Using Microsoft Page Editor?

Introductory notions

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The Microsoft® FrontPage software to create Web sites is included in some versions of the Microsoft® Office *(97, 2000 and XP)* package. Some time ago, web design was considered a job for the programmers who developed HTML (*Hypertext Markup Language*). At this moment, web design became a regular job, similar with working with Word or Excel, etc. Any company, organization, corporate body or anybody may use FrontPage to create and to maintain a site with a professional aspect and updated in the World Wide Web (*or within an intranet*).

Within FrontPage's terminology, a *web project* (***website***) is a page created locally inside your personal computer. It will become a complete web site only when it is launched through a web server and it becomes available to be visited by any other person. So, when you are reading ***web*** (in lower case) you will know it represents the site in your computer, and you are reading ***Web*** (with a capital ***W***) you will understand everything connected with World Wide Web (*the graphical Internet component*).

> *Notice:*
> A web project is a collection of separated pages containing images, text and other multimedia components. The pages are connected with each other through hyperlinks; they can also be connected with other sites within the Web.

Step I. Planning

As with any project, creating a FrontPage website can be very simple or it can be extremely complicated. From all points of view, you can be sure that using FrontPage for such a project is simpler than creating it with the traditional HTML instruments. FrontPage is creating the HTML tags in the back layer; all you have to do is to decide how you want to present your material and the role that it is going to play in your web project.

Considerations regarding the web structure:

- If you have much information that you want to share to your visitors, you have to separate them into associated pages.
- Through an attentive planning of your website structure, you can determine the way in which a visitor is going to access your site, and also the information that you present.
- If you want to insert drawings, images and other multimedia elements, pre-think the time needed by the browser to load them. (You can see the estimated loading time of a page in the status bar).
- Your objective must be to give your visitors all the information without a lot of text to read and with a long loading time that will make them quit and skip to other sites.
- Smaller sites are easier to load, so you should limit the size of the sites that contain images, sound files and other elements that require a lot of memory space.

Establishing the elements that you want to include in your website is the most important step when creating a web project; also, this is the most ignored one too. Most users are hurrying too much to finish everything. Planning is important in every process; it is essential when appearing in an **Intranet** or in the **Internet**. You don't have to plan everything long before, because FrontPage will help you modify the project while working at it, and afterwards. But you must have a clear image of the information you want to present, including the images and the links. The planning method includes the drawing of schemes on paper, using classical sheets (each one having a preview), or by creating a virtual plan on the Web.

Step II. Creating a web project[1]

Generally it is wrongly considered that a web page is a web project. Technically speaking, the web page is a component of a web project. A web project (website) contains more other pages with different names, specific to the data and information hosted. The first and the most important page is the *Index* (the *Home Page*), all the other pages start from it and are connected within subordinate relations through hyperlinks (*Fig. 1*).

To create a new web project click on **new Web…** in the menu bar. FrontPage will open a dialog box called **Web Site Templates** from which **Empty Web** must be selected and then click **OK** (*Fig. 2*).

FrontPage will create a new project, empty, but with specific folders to save pictures (**Images**) and to store system files (**_Private**) of the pages accessed. The whole project has a symbolic name **myweb1**, and an order number that is stored in **C:\Documents and Settings\user\My Documents\My Webs\ myweb1**. From the **Tools** menu choose **Web settings…**, and in the dialog box modify the name of the project from **myweb1** to your own project name (in this case **Tibiscum**) (*Fig. 3 and 4*).

After creating the web project we pass to the construction of the first page of the project that is named **Index**. From the menu bar push **New Page**, and from the dialog box called **Page Templates** choose **General**, click **Normal Page** and then **OK** (*Fig. 5 and 6*).

FrontPage is going to create a new page called **new_page_1.htm,** right click **Page Properties**, and in the dialog box modify the page name to **Index** (*Fig. 7*).
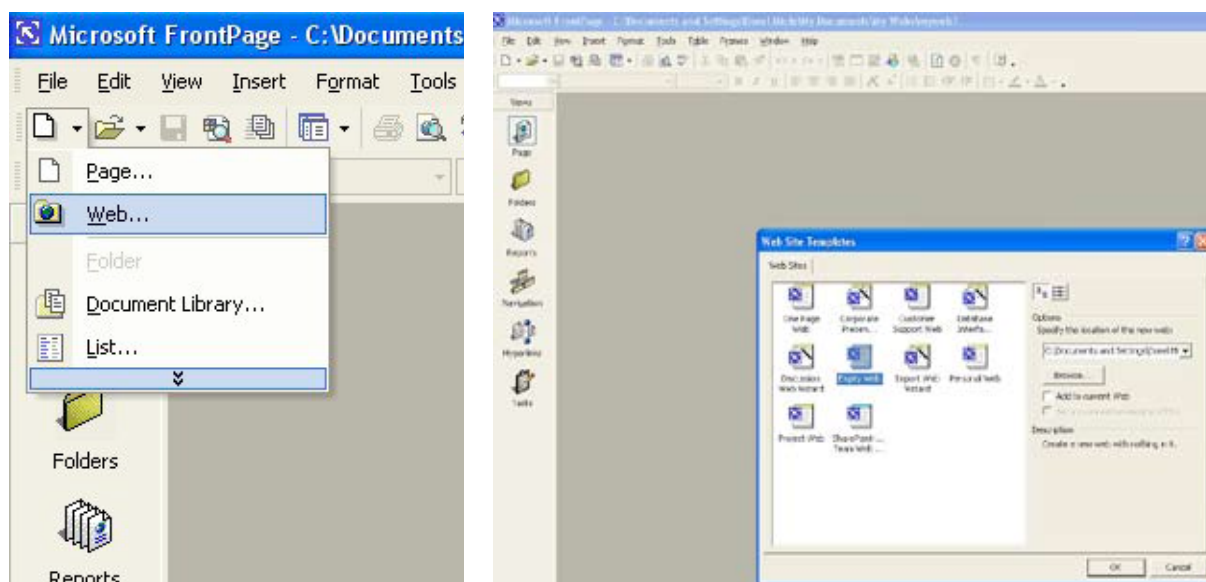
Fig. 1. and 2.
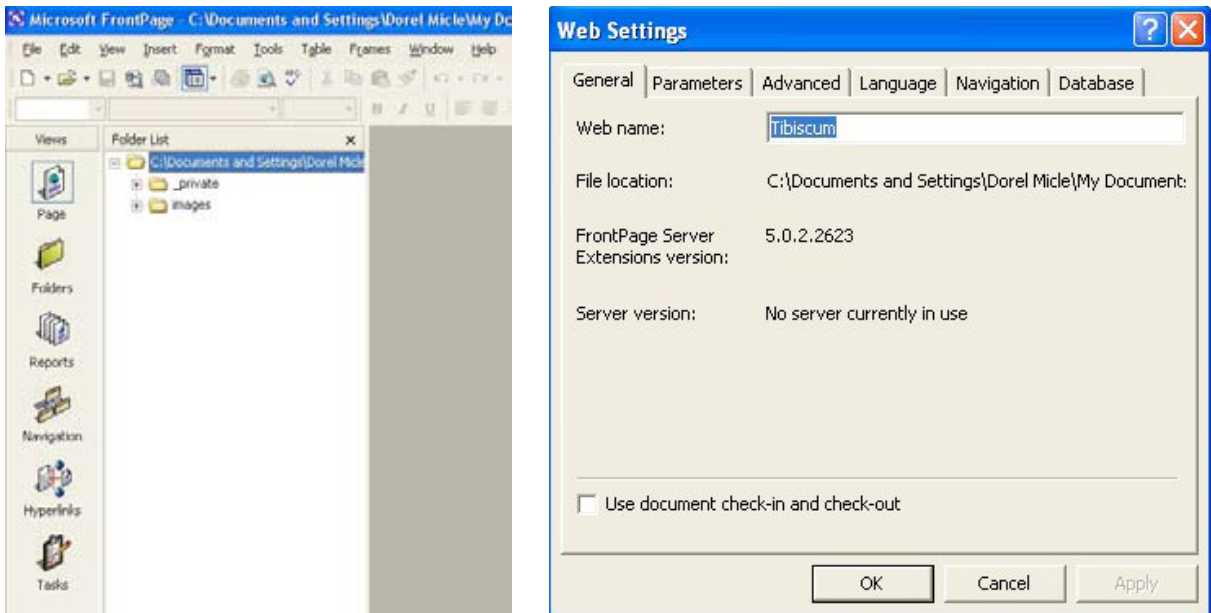
Fig. 3. and 4.
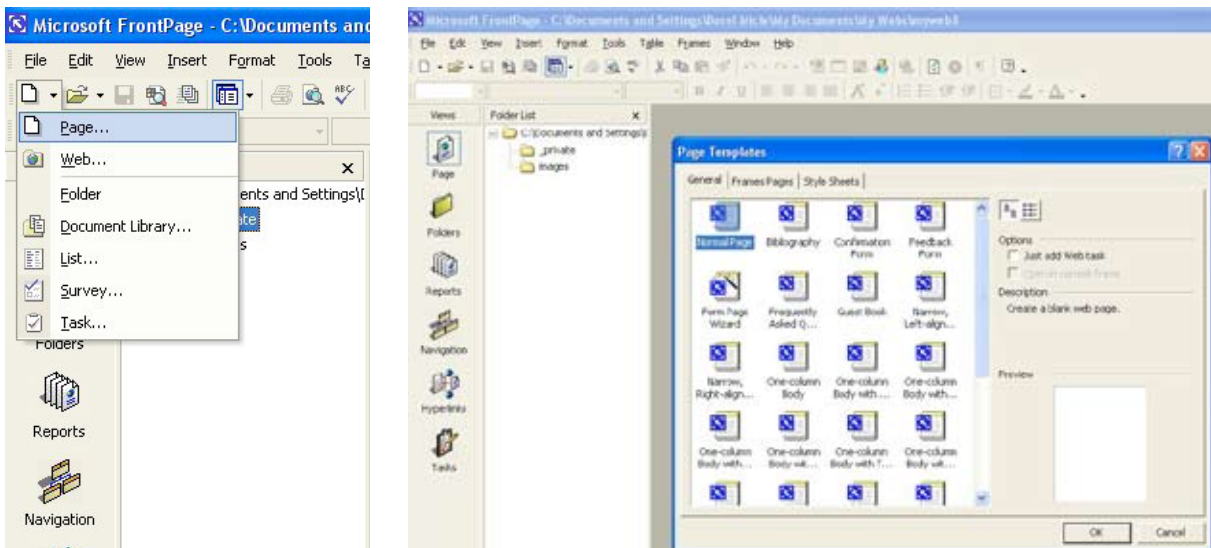
Fig. 5. and 6.

You save the operations with the same name **Index** and the extension **.htm**, and FrontPage will add the new page into the **Folder List** in the left column of the work panel.

If you want the web page to be separated into frames, so the navigation links to be active and visible all the time in a distinct space from the whole page with information (text and images), push **New Page** and in the **Page Templates** dialog box select **Frames Pages**, activate **Contents** and then press **OK**. The page will split into two frames, from which the left one will be narrower and will host the navigation links between pages, and other information about the hosting institution (a *Logo*) or information about authors, and the right one will occupy the largest part of the screen surface and will host the text and the images that represent the information (*Fig. 8 and 9*).

In this case there must be two pages already created, because for each frame separately we must setup the page with the information that we wish that frame to contain (**Set Initial Page…**). For our case, for the left frame, we will setup the page that contains only the navigation links called **Contents**, and in the right frame we will setup the page called **title_pag**, that will contain only a collection of images and
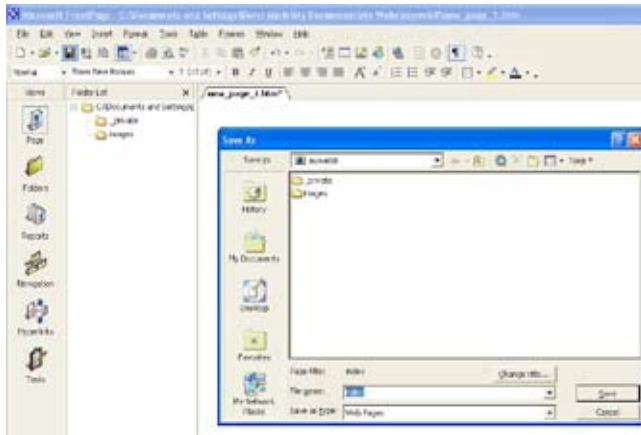
Fig. 7. and 8.
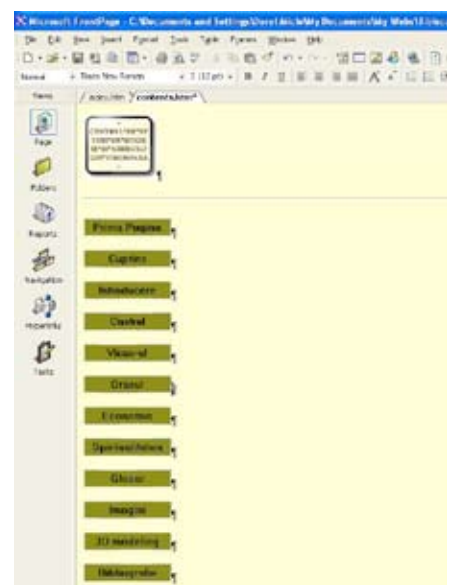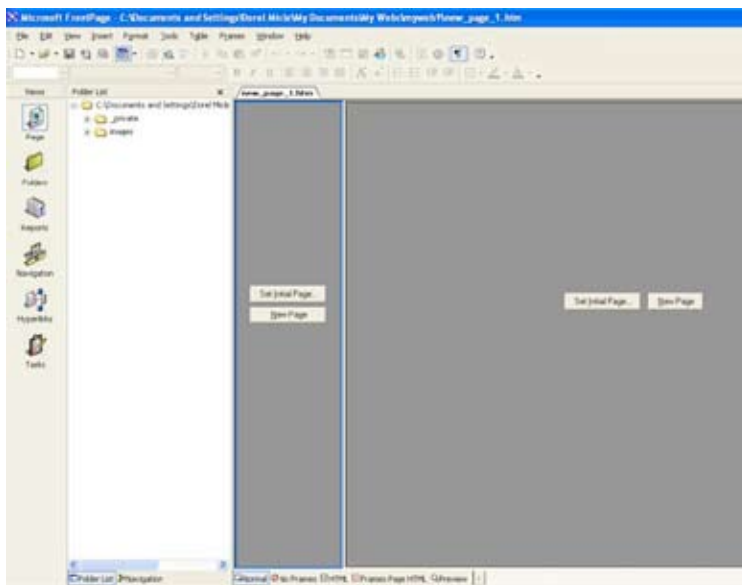
Fig. 9. and 10.

Fig. 11.

Fig. 12.

some technical indications for the user regarding the best resolution and recommending a browser (*Fig. 10*).

This new page will be separated into two frames and we will call it **Index**, it will be the *Home Page* and it will welcome the visitor (*Fig. 11*).

The rest of the pages will be constructed after its model, except that in the left part it will be maintained the page that has been setup at the

Fig. 13.
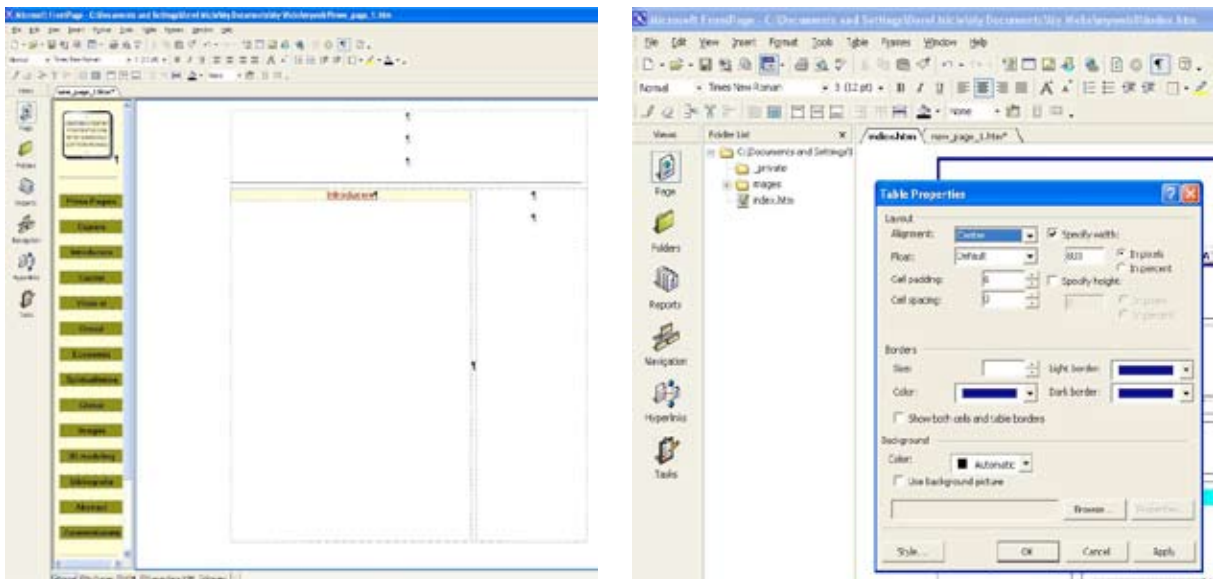
Fig. 14. and 15.

beginning, **contents**, which has the role to show the navigation links, while in the right part it will be maintained setup for each time another **New Page**, which will contain current information and will be saved with the desired name by the *webmaster* (*Fig. 12*).

Usually, it is assumed that in the projecting step of the website, the user has drawn the hierarchical diagram and the links between pages, and the pages' design, so from now on the effective construction of the web page can be started.

One of the best methods to work in FrontPage is using tables within tables. Working with tables allows an ordinate and precise configuration of the spaces used for text, images, movies, etc., and the centering of these media elements, establishing the resolution, etc. The rows and the columns of the tables are calculated according to the page design established by the Webmaster, maintaining free spaces between text and image boxes. If you don't want some borders of the tables to be seen you can select these and hide them.

To build tables select Insert Table from the menu bar and with left click drag right and down to select the number of rows and columns desired. Splitting or merging cells can be done from the Tables menu bar through the Merge Cells and Split Cells links (*Fig. 13, 14*).

Because the visitors of the Website can browse with different browsers and can visualize with different resolutions, it is recommended that the Webmaster should specify the standard pixel dimensions of the table and alignment to the center of the screen. These configurations can be modified right clicking the table and selecting **Table Properties**. In the dialog box check **Specify width: 803** (in pixels) and **Alignment: Center** (*Fig. 15*).

With right click and select Page Properties…, you can insert an image as background of the whole page. From the Background folder select Background picture, search for the edited image that is found in the Images folder of your project and press OK to select it. The image chosen as background must be representative for the subject of the project (or it can be abstract) and it must be as pale as possible (features regarding contrast, light and color must be modified), so the text and the images representing the information, which will be over layered, can be accessible. No matter the size of the background image, it will be multiplied on the whole page, and that is why it must be carefully picked, so that the combination should look good (*Fig. 16*).
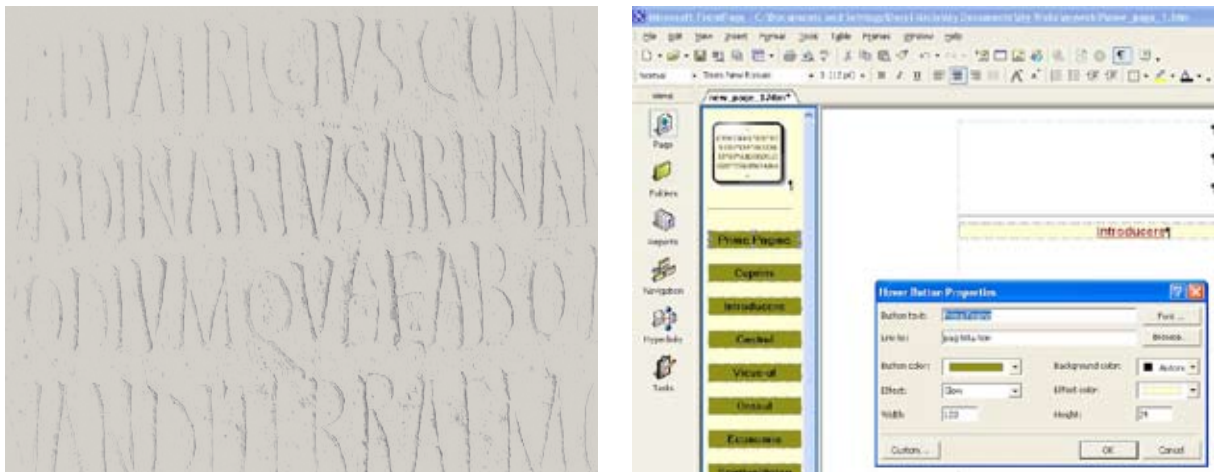
Fig. 16. and 17.

In order to create hyperlinks between pages you must use the Web Component link from the menu bar, and after opening the Insert Web Component dialog box chose the first component, Dynamic Effects, from the left column and Hover Botton from the right column, and then press Finish. FrontPage will create a link (a Java application), and will open a new dialog box, Hover Botton Properties, where you can modify the color of the link, the effect of the link, the text, the type and the color of the font, and the configuration of the hyperlink through the specification of the page or the web address to which you connect it. The procedure can be repeated until you finish all the links between the pages of the website.

It may happen that some users have not advanced or updated browsers, or they may not have Java applications. In this case the Webmaster should think and implement an alternative system of linking pages, through hyperlinks on images and text. Usually, an alternative system of hyperlinks involves the existence of a menu bar in the header or the footer of the page that connects the name of the page with the page itself. For this alternative system you must first write the names of the pages, and then select each one and push the Insert Hyperlink link from the menu bar, in order to create the hyperlink (*Fig. 17 and 18*).

FrontPage will open a dialog box, Edit Hyperlink, where you can chose between a link to a web page from your project, an area from the header or footer of your current page, another web address or an e-mail. In this case, from the list with own pages of your project, we will select the page corresponding to the name to which we want to connect the hyperlink (for example, for Home Page we will select Index) (*Fig. 19*).

To create a pleasant aspect for the web page, it is obligatory to have equilibrium between text and images, that is why we have to replace some text hyperlinks with image hyperlinks, through editing these images with a graphic editor (Corel, Adobe, Jasc, etc.). The hyperlink can be made of a collection of images and artistic text, only artistic text or only image (which should be representative for the text).
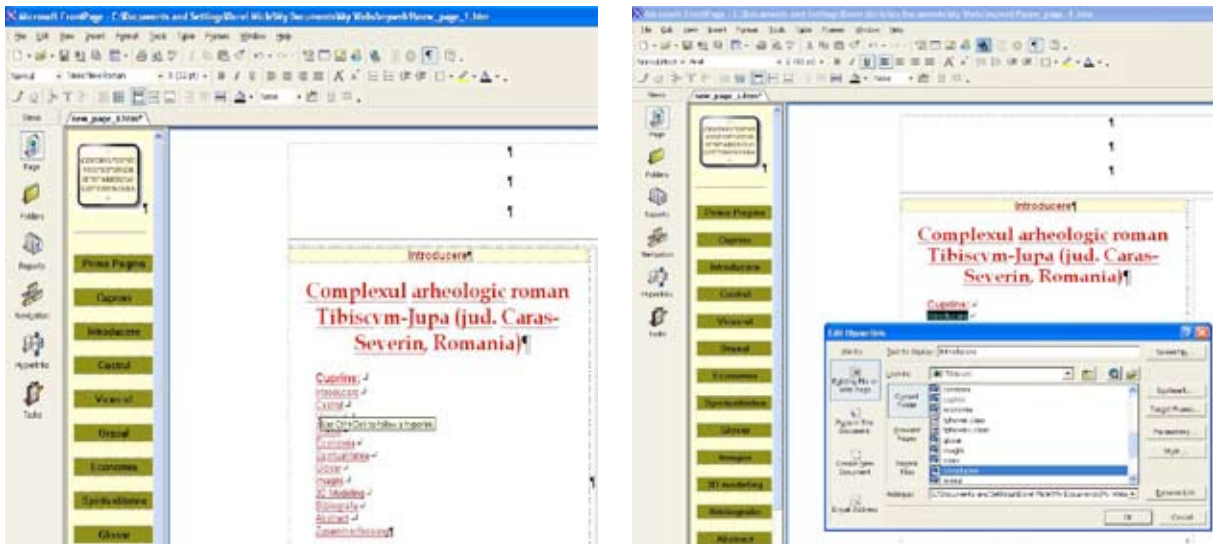
Fig. 18. and 19.

The images must not be too large but clear, representative. stilled and saved with the extension .jpg (*Fig. 20*).

The image or text hyperlinks can successfully replace the navigation links, which are Java applications and can create problems to some browsers.

After inserting all the graphical and navigational elements, the text information is inserted, with the message you want to transmit through the page. The text can be edited, just like working with Word; you can modify the font stile, their size, color, alignment, spacing and indentation. For this procedure you need to select the text to edit, right click and select Paragraph… FrontPage will open a dialog box where you can modify the indentation and spacing. The font's stile, size, color and other features can be edited from the menu bar Formatting from the main menu (*Fig. 21*).

Generally, for a better understanding of the text, you should choose Arial or Verdana stile, size 2 (10 pt) and a Justify alignment. The text should be Bold just in titles and subtitles and it should be Italic only in quotes. It is recommended that you don't overuse to emphasize text features like Bold, Italic or Underlined modifiers because they can create fatigue. The text color should be in contrast with
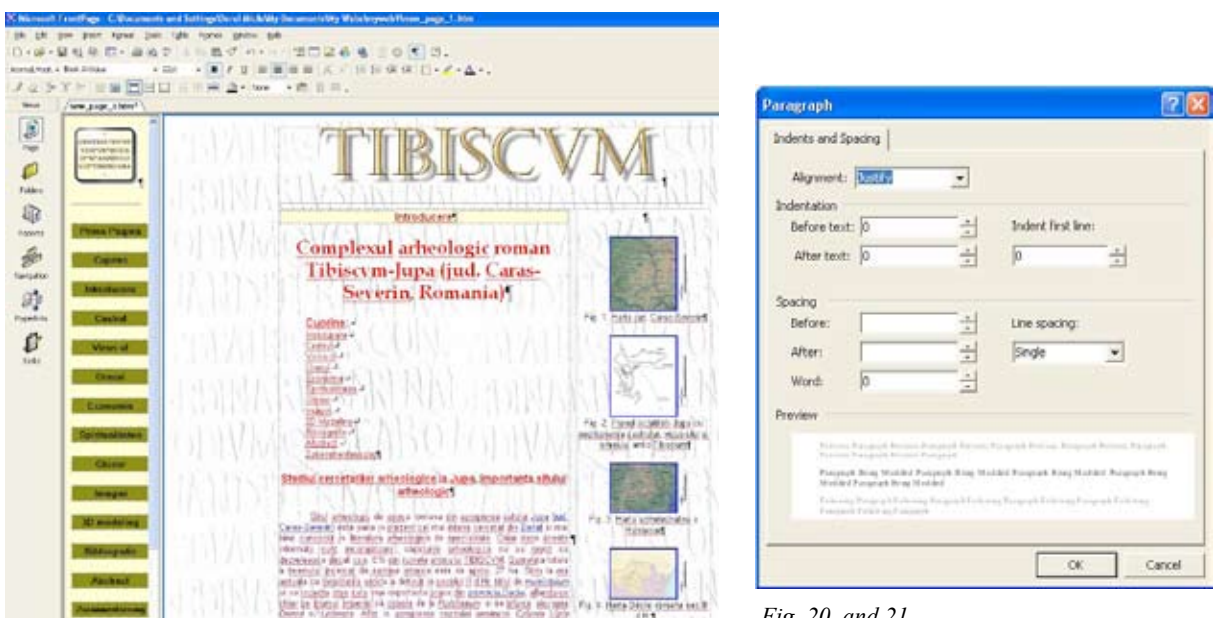
Fig. 20. and 21.

the background color and in accordance with the whole page. In most cases we choose cold, sober, expressive colors, which don't disturb the view.

> *Notice:*
> Don't forget that in the case of a science website the most important is the text, the knowledge you want to share, being less connected to graphics, and in the case of a popularization website there must be a balance between the text information and the interactive graphics that should attract visitors.

The images can be inserted inside the text or in certain spaces specially allocated. In our case, we preferred the insertion of the text on the left column and the images on the right column, connecting the level of the image with the text one. Through this we created a perfect balance between the left frame, which contains the navigation links (and which can be considered graphics too), the science text that is located in the center and the popularization images, which close the column from the right side of the text.

The images have been edited with Paint Shop Pro from Jasc Software and resized in the column with the help of the **Auto Thumbnail** option from the **Pictures** menu, the one that deals with image editing in FrontPage. In this way, only a reduced image of the original is shown in the web page, and it can be viewed full size after a click on the thumbnail.

> Notice:
> The images must be saved in their folder, **Images**, which can be parted in sub-folders for science images and technical ones (links, banners, logos, backgrounds, etc.).

This web editing software, FrontPage, allows hyperlinks of the *Top-Down* type inside the same page, in the case when the page requires the use of the vertical scroll-bar. For this you have to choose a space, word or image from the header of the page, which is selected and registered as *bookmark*, through the **Bookmark…** command in the **Insert** menu. The Webmaster has the possibility to name this bookmark in the dialog box opened, and then a word from the page footer is selected (or from anywhere inside the text) or an image (arrow, *top*, etc.) and click **Insert Hyperlink** from the **Formatting** menu to specify the path in the dialog box by selecting the word registered in **Bookmark**. The procedure is repeated for each page separately, or for any other bookmark on the same page, whatever the direction is: up or down.

> *Notice:*
> It is recommended that the information should be presented as text and image only at the screen size so the user won't use the scroll-bar, vertical or horizontal. In this case the information will be divided in more sub-pages, and the webmaster is obliged to create a smart navigation system by showing the current page number, the visited page numbers and the unvisited ones.

After creating all the pages, the hyperlinks between the web pages that belong to the web project must be re-checked and also the hyperlinks with the Web pages already launched on the Internet. A good, logical, practical, simple and intuitive navigation system increases the quality of the website and the number of visitors.

To insert more complex multimedia elements such as video files, click on **Web Components** from the menu bar and from the left box, **Component Type**, choose **Advanced Controls**, and from the list in the right part choose **ActiveX Control** and then **Next**. From the list choose **Windows Media Player** application and then press **Finish**.
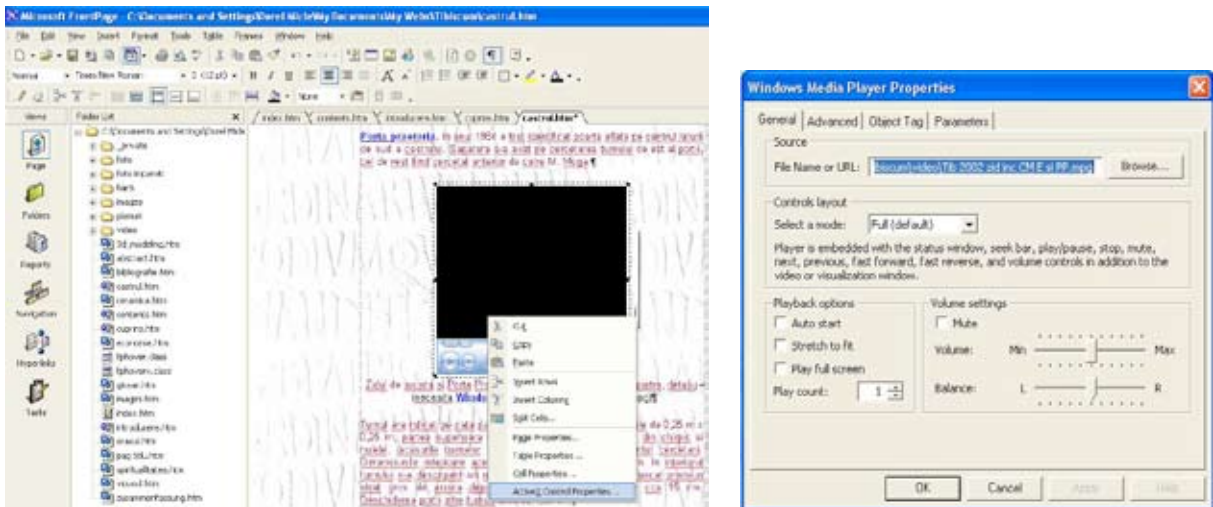
Fig. 22. and 23.

Through a right click on the video window you can activate from the contextual menu **ActiveX Control Properties…**, and in the **General** folder the target is inserted (the video itself). From the **Parameters** folder you can modify the video features (the most important are: *autostart=0* and *enabled=1* so that the video starts only when the user requires it) (*Fig. 22*).

Don't forget that you have to create a folder named **video** within the project, which contains the video files from the website. If you used video files from a local folder when you tested the page on your personal computer, when the project is launched through a server, it must contain the video folder with the video files, and the target must correspond with the server folder, or it will not work (*Fig. 23*).

Notice:
It is recommended that the whole text should correspond with the language for the web publishing. There is the tendency to create hybrids between science text written in the national language and the other texts – link text, the hyperlinks text of the navigation images and the page titles – in English (international language). If possible, the web project should be done in both national and an international language

The building step itself is concluded with the introduction of some technical elements such as:
• Visitors count (for traffic control there are special sites, at national or international level: www.statistici. ro or www.trafic.ro for Romania, which will index your site and will send a logo of the site and the target for the counter);
• Creating a special page for contacts with information about the authors (e-mail, address, phone number and fax) and information about the Webmaster (e-mail);
• Show when you last updated your site;
• Terms and conditions for copyright.

Step III. Testing, registering on a server and indexing for search engines

Normally, registering a Web project on a public or private sever, requires a hosting contract which means a service and update agreement. In most cases the agreement includes buying a domain (***.ro**, ***.com**, ***.edu**, etc.) or to include the web project in the host website, which means that the name of the server or of the institution that is hosting will be included into your Web address.

Registering to a search engine depends on their server. Most services have a link of submission of an URL to their search page. Generally something like: **Add URL**, **Suggest a Site**, **Add Your Page**, etc. You have to search the page or use the **Help** of the engine. There are automatic registering services too. One of them is **Submit Express** (http://www.submitexpress.com).

In order to be found automatically by the main Search engines (Google, Yahoo, AltaVista, Mamma, etc.), in the header of the page (HTML version) you can insert **meta tags** (**Title, Meta Keyword, Meta Description**) which should contain keywords or a description of your project in the national language and an international one too.

Another registering modality is to register to a specialized portal. It is sufficient to e-mail the Webmaster of the portal and to ask him to consult and to index your project in the list of websites, at your category.

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Museum Collections Catalogues and Archives Online: a Reference Resource for Professionals and a Learning tool for the Public[*]

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Introduction:
Digitising your collections the right way?
A discussion of what to do and how to do it when publishing online

When invited to participate in the summer course in Bușteni, Romania, arranged by CIMEC with the support of the EPOCH NoE[1], it turned out that this was a good opportunity to go through in my mind some major part of the work that we have accomplished at the Unit for Digital Documentation during the last fifteen years.[2] The result of my reasoning is presented in this chapter. The description is based on real life experiences, but I have tried to combine these with several principles of good practice based on our experience as well as influence from colleagues, both in Norway and abroad.

This chapter is intended for a reader working at or for a museum. A museum may be described as an organization which documents our tangible or intangible cultural heritage. In most cases, an important part of this documentation is accomplished through the possession and curatorship of artifacts. Such artifacts may include a variety of types. Artifacts in museums may have been created during the past year, or they may be millions of years old.

The intended reader of this chapter would like to publish online. This chapter is concerned with what we publish online, why we publish online, what publishing online may involve, as well as how to go about to do it. Needless to say, each part is covered only in brief. Hopefully, it gives the reader an overview of some of the questions which must be considered and discussed during this kind of process. I am afraid this chapter does definitely not give all the answers.

The digitization process: Why?

Who needs to digitize?

There are several positions to be filled at a museum, as in any organization. In smaller museums several of these positions tend to be filled by the same individual.

A museum has an owner. This owner usually appoints a board or a similar body which is responsible for the strategic decisions at the museum, such as the budget and the appointment of key staff. One

or several directors have administrative and scientific responsibilities, supported by an administrative staff. There are, at least in larger museums, highly educated curators working scientifically with the museum collections. And there are people running the practicalities, such as guards, entrance ticket sellers, maintenance workers, etc. And, of course, these positions are mixed -i.e. there is not always a clear line between maintenance work and technical conservation.

People from all these categories may want to publish online. But their reasons for doing so tend to vary, and these differences often lead to different answers to several other related questions.

Where does the digitized material go?

For a board or an administrator, digitization is often seen as a means of promoting the collections at the museum. Digitization in this respect often results in an exhibition of some kind, and quite often only a selection of items of particular importance is digitized.

Another important motivation for administrators at museums is the need to create better administrative systems. The result is often the establishment of databases including descriptions of objects (so-called metadata, previously called catalogue data). In many cases, this kind of databases is not published, but many museums realize the importance of publishing the catalogues describing their objects on the web, especially when images of these objects are also available in digital form.

Museums need funds in order to exist. Many museums rely on entrance fees and other types of income from visitors, such as a surplus from the museum shop, on their budgets. There has been a concern that a large-scale publication of images on the web may stop people from coming to the museum, because they will use the web instead. While there may be some truth in this in some rare occasions, this is seldom a major problem. The effect of creating an interest with potential visitors by showing them images of what they may see at the museum in terms of real artifacts usually attracts more visitors, and it helps people in planning their visit and in choosing which museum to go to.

The digitization process: What?

Even without digitization, most museums actually possess digital material. Letters are written using word processors, pictures are taken with digital cameras, and books are printed using typesetting software. An institution may choose not to keep these digital originals, only archiving the paper versions of the documents. However, there is much to gain from using the digital versions, especially when they are seen in connection with material being digitized from analogue sources.

Types of material

When the decision has been made to digitize material at a museum, a selection must always be made. My list of some of the types of material commonly in the possession of museums indicates why this is necessary:
- physical objects
- images
- sound recordings
- films and videos
- index cards and other reference information (metadata)
- letters and other archive documents
- books

It is interesting to note how the features characterizing museums as institutions different from other 'memory institutions' – their physical objects – are the things we cannot digitize. Maybe this is one of the reasons why *the Digital Library* is a much more important concept than *the Digital Museum*.

In most situations, the most important feature of a book is its readability. When making a digital version – a running text and facsimiles – most people would say that the important features of a book

are captured in the digital version. Even if examples of the opposite are easy to find, this holds true for most books.

With respect to a museum, however, the situation is quite different. Even though it may be possible to find examples of digital versions of objects in museums in which the most important features are kept – e.g. as is the case, it could be argued, for some types of visual art – this is very uncommon. The 'touch and feel' is vital for the understanding of what an artifact is, even for museum visitors who never come any closer to many objects than looking at them through glass.

This it not to say that digitization is irrelevant for museums. What I am trying to say is that most digitization work in museums involves either creating representations of objects (images, 3D models, descriptions), or secondary material from the museum's point of view (archives, books, sound recordings, films) and catalogues.

In this chapter, I will not discuss creating models of artifacts such as axes or boats. Other chapters in this book will discuss this kind of representations of objects. In this chapter, I will discuss catalogues and, to some extent, secondary material.

Whose material?

Usually, digitization is performed on your own material. But for an institution with a specific thematic responsibility, it is sometimes important to retain digital versions of material kept at other institutions. If such versions do not exist, the owner institution may in many cases let you digitize their material, at least if they receive a digital version for free; or they can be paid to provide you with digital versions.

An example of this is the Ibsen Manuscript Project at the Centre for Ibsen Studies at the University of Oslo. The project period was between 1998–2000 including the following project goals:
• Locate all original manuscripts and letters written by Henrik Ibsen
• Track down material that is still unknown to the research community
• Make digital facsimiles of all manuscripts and letters.

The digitization part of the Ibsen Manuscript Project did not aim at digitizing a particular collection of documents from one archive, but the writings of Henrik Ibsen wherever they were found. The manuscripts of his plays, poems, articles and speeches constitute a relatively small number of items located in some 10–15 collections, whereas ownership of approximately 2,700 known letters, telegrams and dedications is spread between 100–150 different libraries, archives, museums and private collectors. All manuscripts of Ibsen's plays except for one were digitized during the project period, whereas only half of the letters known to have been written by Ibsen were digitized (Eide, 2000).

How deep?

When creating digital versions, representations or descriptions of material at a museum for online publication, there is a choice between different methods and various levels of detail. Often more than one method may be used at one particular institution.

Digital representations or descriptions of objects?

A digital representation of an analogue object captures important aspects of the object. Photographs of an artifact may be one type of representation, but even better representations include 3D models or video recordings. A description, on the other hand, may be a prose text about the object, or drawings of the object. For textual material, a distinction may also be drawn between digitisation of the text through keying in or scanning and OCR reading on the one hand, and an indexing of the text on the

other. Indexing may include anything from just a few keywords from a controlled vocabulary to an identification of all persons, places and events in documents.

As described above, digital versions of artifacts are usually impossible to make. However, digital versions of textual material, photographs, maps and other 'flat' memory objects are often possible to make, containing all relevant aspects of the original for most users.

Data or metadata

For a museum curator, a catalogue of the artifacts means a collection of metadata. But for a researcher carrying out an investigation of the history of classification in institutions, a catalogue may be an important source in its own right for this study.

For almost 170 years the archaeological museums in Norway have on a yearly basis published information on their acquired artifacts in terms of written acquisition catalogues. The descriptions of finds in these catalogues are quite longwinded, including extensive information of the finds, the find contexts, their place and time, the finder or excavator, as well as detailed descriptions and classifications. The series of catalogues served for practical purposes as the main artifact inventory of each museum. These catalogues have been digitized and XML-tagged. In order to investigate some of the aspects of the history of archaeological documentation, we analyzed the number of elements of various kinds in the catalogues, sorted by the year of publication of the catalogues. Although these results must be interpreted based on knowledge of the institution's history, we were able to find several interesting tendencies in the changing use of measures over time as expressed in the catalogues. (Eide 2003)

Another interesting examination quite similar to ours is Fiona J. Tweedie et.al.'s examination of the history of book publishing, using bibliographical sources. They were able to find several interesting tendencies, and encouraged further research in this direction: 'We have used statistical techniques to investigate aspects of publishing history using data from the new online version of DEBORAH, incorporating RSTC, and now being prepared for use via Internet. We have shown that the number of books published between 1475 and 1640 increased quadratically, with little regard for the imposition of censorship. [...] The DEBORAH project offers the researcher an unprecedented opportunity to examine, both quantitatively and qualitatively, the publishing history of this period, and will no doubt inspire a large body of work.' (Tweedie 1998)

The digital register

A digital register should contain enough information about the artifacts in the collection to make it a good tool for the management of and research on the items at the museum. Thus, it should contain a thorough description of each item, although in many cases the objects of description will have to be groups of items – no one can make a catalogue describing each and every fragment of Stone Age chipping in a large collection. It should also include some kind of classification, such as time period, peoples and use, as well as images and sketches of the items. This is similar to a written or printed catalogue. If possible, it should further include 3D models and reconstructions, but this is seldom possible for more than a small fragment of a collection. These can be compared to physical reconstructions.

All in all, the digital register is quite similar to a paper-based catalogue. It is the use of it, the ease with which it may be published and linked to the catalogues of other institutions, which is the main added value of using computers, in addition to lower production costs. The reductions of costs should not be overestimated, however, because the intellectual work and the physical handling during cataloguing is very much the same as that required for catalogues produced on paper.

The digitization process: How

The following description of the digitization process will mainly take into consideration the reference material at a museum. In institutions other than museums, this kind of material is regarded as first class material, e.g. in an archive, images and texts are considered as the actual collections. When this is the case with respect to a museum, this is because there are few pure institutions. Many museums are partly an archive and partly a library as well, or at least they have a library as well as archives available to their employees.

There are many different techniques used in digitization. The results of digitization processes may be divided into three categories, each with its special problems. The end result of many digitization projects is a combination of these types of digital objects.
• A database. Who will be able to use it? Will there be public access to it?
• Files. Who will manage them? Will they be published?
• Web-pages. Who will update them?

But there are more fundamental questions to be considered before the choice of technique is made. One of the most important questions is: What are the digitized versions made from? Are they digital *versions* of old material or are they digital records *based on* old material?

In many institutions, it is common to build up the digital catalogue without including the history of what happened before the catalogue 'went digital'. The reference material on paper is then stowed away and never used again, with the rare exception of institutional historians and researchers who are particularly eager to go to the original sources.

Other institutions, in particular large institutions more engaged in research, give the material a more thorough treatment. This includes digitization of old records. The digital versions of old records are then used as an important source when creating updated records. When new catalogues are made in this way, the digital versions of the old reference documentation may be kept available for interested users.

Catalogues and the notion of truth

The decision of not making old versions of the catalogues and other reference material in digital form available to the users carries some serious drawbacks. Making a new catalogue based on old sources combined with new knowledge is necessary, and any curator should of course do her best in order to make sure that the catalogue represents the current knowledge. But the concept of truth with respect to historical knowledge is problematic. Without entering into a discussion of the impact of post-modern views on museum curatorship, I would merely like to say that in my opinion everything that gives a user better access to the sources of the reference material is an advantage.

On the other hand, the process of digitizing the main sources of the previous decades and centuries is often expensive and time-consuming, and it is not necessarily easy to convey the importance of this to a board or to the owners and founders of a museum.

A choice has to be made by each institution, and it is often possible to add some of the older sources without going through a full-scale digitization process. But it is important to consider and discuss the choices that are made, and to understand what you are doing.

From paper to database

The following sections describe an ideal way to build a database based on old paper-based catalogues and new knowledge. My description is based on fifteen years of experience with digitization and creating databases at several projects, among them the Norwegian Museum Project. By ideal I mean that it is not adhered to completely with respect to any collection, but it is still real in the sense that each of the steps

has been applied to large collections, both in Norway and in most cases in other countries as well. I will mainly describe work carried out on texts of various kinds, such as printed books, manuscripts, printed and handwritten catalogues, archives and letters.

The ideal solutions are normally not possible to apply in full scale, but should be considered as a description of how the work could be performed in an ideal world. In addition to curatorship traditions, this method is influenced by the traditions of digital edition philology. It regards any document at a museum as a potential source of unique and important information, both concerning the collections kept at the museum, considering lost items (of which often only written descriptions exist today), and considering the history of the institution and the subject fields of the collections.

The work carried out on a document collection consists of five distinct stages: Description, scanning, establishment of a digital text, content mark-up and application.

1. Description

A description is what is known as cataloguing and classification with respect to libraries, and as archive description in connection with archives. When using a text as a source, the historical and cultural role of the text is an important source of information in order to help us understand how to use the text – a short catalogue description written by a curator differs from an article written by a researcher, and a police report (which is quite common within archaeology when monuments are destroyed) differs from an anonymous letter. In addition, the year of writing of a text is important with respect to the interpretation of it.

This is basically a question concerning the rhetoric of a text – the text was written by someone for a particular purpose, and the more facts we can establish about the context, the better we will know how to interpret the information given in the text. In this work, the well-established methods used by libraries and archives should be applied.

2. Scanning

When scanning a text, a digital image of each page is made – an image which for most purposes reflects the relevant information written on the page, as well as sketches and drawings. Keeping this scan and making it available together with the other information is important, both in order to make it possible for future users to check whether the later interpretations, including the establishment of a digital text, are correct, but also in order to give hard evidence – as hard as can be given without presenting the original. This is particularly important concerning archive documents compared to published books, as published books are available in a lot of places. Further, it is more important for hand-written manuscripts compared to typed or printed texts, as handwriting is more likely to be misread in the process of digitizing the text.[3]

3. Establishing a digital text

Establishing a digital text is done by OCR reading or typing a copy of the original text. OCR is an abbreviation for *optical character recognition* and constitutes a class of computer programs which translates an image of a text into a text, based on recognition of the physical shape of each character. This method is quite effective provided that the text is suitable for this method. First, the text must be printed or typed. It is impossible to OCR read existing handwriting for a lower cost than that of typing it manually.[4]

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[3] At the Museum Project, the original scans of printed books, which were used for OCR reading of the text, were not kept. This was mainly due to storage costs, as this work was done in the 1990s.

[4] It is true that hand-held devices may read some sort of hand-writing, but this requires training by the person writing the texts, an option that is not available for old texts.

OCR reading does not work well with all types of texts, although the technology is improving. Older printed books are usually less suited to this method than more recent – a rule of thumb is that books older than the middle of the 19th century are less suited to OCR reading. Further, rare typesets are more difficult than common ones.

An important aspect of OCR quality is the use of word-lists of the languages represented in the text. This causes problems with old texts as their spellings differ from our present standards. Similar problems exist for smaller languages, dialects and technical language. Both the typeface and the spelling problem may be reduced by training the OCR software. But in order to make it worthwhile with a training period, the quantity of material has to be significant.

It is also important to consider how the price you pay for hiring people compares to the software and hardware investments necessary to do OCR reading. When smaller quantities of texts are to be converted, people may also be reallocated from other tasks, and often the time required to train a transcriber is shorter than the time required to train an OCR operator.

4. Content markup

A digital text may be made available on the web for use inside and outside of an institution, and it may be made open to search as free text. But in order to make it more functional as a text, and in order to make it possible to extract information from it into a database, markup is essential. The only markup language possible today is XML, but there is a choice between different kinds of XML. HTML is a kind of XML. But for our purposes, we recommend using a better kind.

What is XML?

Many readers know the meaning of HTML. A short explanation is that XML is more than HTML. To be more precise, HTML is written in XML. To be very precise, HTML was written in SGML and XML is a simplified version of SGML, while XHTML is written in XML.

HTML is one way to express the contents of a document. This means that it divides the text into elements such as headings and paragraphs, <h1>, <h2>, etc. and <p>, and several other items you may find in a document. HTML is not extensible, and as it has no pre-defined way to tell you that a certain part of a text is a personal name or an archaeological period, this kind of information is hard to enter in a structured way. To make things worse for our purpose, some of the expressions of content used in HTML, such as tables, are used for typesetting. Most HTML tables on the web do not resemble tables as we traditionally know them, with rows and columns. HTML tables are hidden structures used to divide the screen into sections according to the intention of the producer of the web-pages. Some people consider this as some kind of a moral problem. I do not, but this fact makes HTML an even less suitable tool for our work.

With XML, you mark up elements that you consider important in the text. In connection with a name, you can use a tag such as <name>. In connection with an archaeological period, you use a tag for that. As a result you may use the text for different purposes. The idea is to tag once, and to use many times, as shown in *Figure 1*, and similarly, to have one source, and many outputs.

Why XML?

It is sometimes heard from people working with databases that there is such a thing as unstructured data, and that this is commonly found in information carriers used by humans, such as books or the sound of spoken words. Whereas it is indeed true that unstructured information exists, the latter claim is untrue.
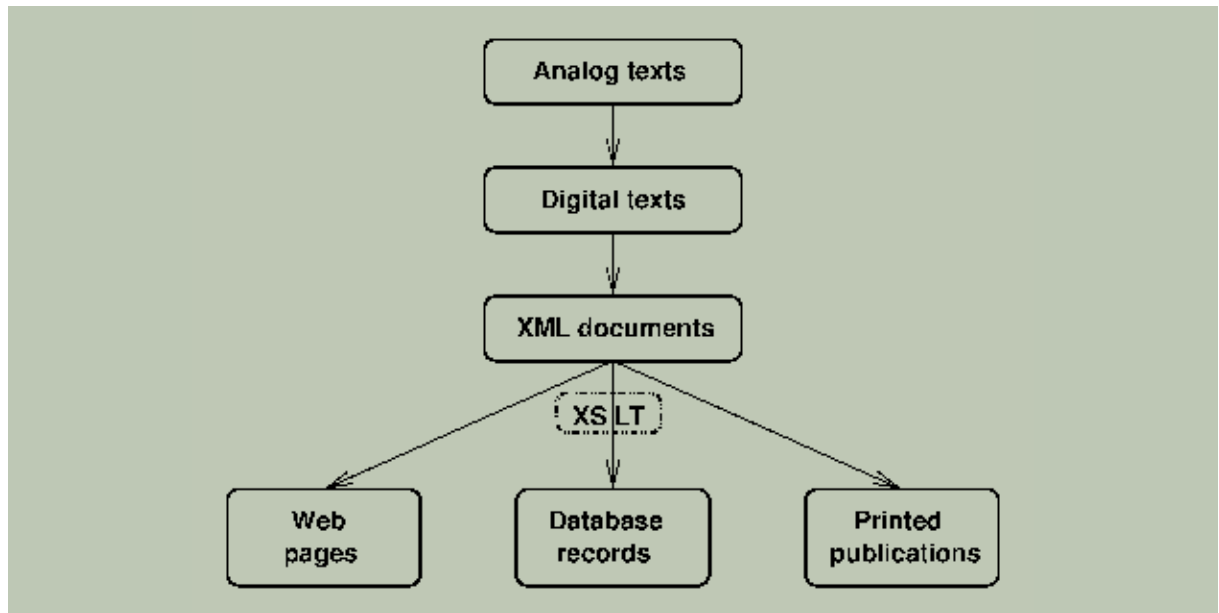
Fig. 1. The XML pipeline (which is a tree): Input, tagging, output. [Image file: eide_fig1.tif]

Books are very rarely unstructured. The reason why this claim is made is that the structure is organized in a way not easily interpreted by a computer program.

A human reader familiar with the language of a text applies a huge stock of knowledge in decoding the text. Capital letters often signifies proper names when these are found in positions other than the beginning of sentences, and when the text is not written in a language such as German or old Scandinavian where capital letters could signify a common noun. Italics in a certain text may mean artifact number, whereas in another text it may signal that the word is the name of a ship. Details such as these are normally not described in manuals (although more complicated printed information systems, such as dictionaries, tend to include such manuals); the reader figures them out by interpreting the various signs and comparing them to her knowledge bank.

This is a very different method compared to the way computers work. The computers' basic functions relate to zeros and ones, it is often said. This is true, but stating this is not very enlightening – humans operate on a biological level, but that does not explain poetry. The computer has a notion of characters, and may even divide a pure text into separate words, although it may make mistakes. The main difference compared to a human reader is that the computer does not understand the text. A computer is like a person knowing Arabic script but not knowing the Arabic language. She can 'read' a text, meaning that the text may be spoken, but she does not know the meaning of what she is reading.

All the implicit information available to a human reader with knowledge of the language is inaccessible to the computer. In order to be able to use the computer's capacities in handling information fast and correctly, some of the implicit information has to be made explicit.

This is where XML enters the stage, and this is why HTML is not enough. With HTML you can state that the ship's name was in italics in the printed book which the HTML text is based on, e.g. <i>Titanic</i>, but this only tells the computer that the word in italics has something in common with other words in italics – these words may be in italics for very different reasons. Using XML, you may use an expression such as <name type"ship">Titanic</name>. Or even better, you state <name type"ship" id="12345">Titanic</name>. The additional information in the last example may then be used in a name database to link all incidents of the well known 'unsinkable' ship together, separating them from the incidents of the name of a small ferry also called Titanic. The human reader catches this difference easily when reading and understanding the text. Using this markup, the computer may differentiate the information even if it cannot read and understand the text.

In addition to this, XML is a convenient way to store information from the original text such as chapter and paragraph structure, text attributes and footnotes. In many cases, the computer may even be used for tagging aspects of the text as many texts are structured quite consistently. Catalogues, for instance, may often be auto-tagged based on line-breaks, italics and the organization of certain numbers and letters. But this kind of tagging always has to be proofread and in most cases improved by a human operator.

The truth of the XML text

After all this talk about the strengths of XML, the time has come for a minor alarm. When tagging structural aspects of a text such as paragraphs and italics, major disagreements on how to tag a text seldom occur, as the identification of such structures in the text is quite straightforward. But some tagging is very much open to discussion – some of them seemingly endless. Let us for instance take an attempt to tag all metaphors in a text, which could be tried out on literary texts. How many literary scholars would agree on how to do this?

Further, there is a rough line between syntactic and semantic tagging, and between structural and content markup. There is, of course, nothing wrong with interpreting a text. All classification of material in a museum is also based on interpretation. But it is important to be aware of what interpretation is and what is so obvious that it is rather a statement of facts.

Data analysis

What to tag or not to tag is a very important question? This is one of the major aspects of the data analysis. XML tagging is really not a technical skill. Or rather, the hard part of it is not. The hard part consists in analyzing your data.

The analysis of the data includes two major steps: What is in the text, and what do you want to get out of the text. It is important not to use many hours of work on tagging which is never used. E.g., it is not a good idea to tag every weight mentioned in the text if the tagging of this type of information is never used systematically by a computer system. On the other hand, it is often useful to tag paragraphs, and in many applications names of persons and places are useful. In order to get an idea of how to organize tagging, standards and guidelines such as the Text Encoding Initiative (TEI) and the Encoded Archival Description (EAD) are good starting-points. The TEI guidelines are available on the web, and there is a lively discussion on their mailing lists.

Although the TEI guidelines describe how to perform tagging on many types of humanistic texts, there may be aspects that you are unable to tag without adding local elements to the TEI. One reason for this is that the TEI community is not closely connected to the museum community. Work is going on to relate major museum standards to TEI, and museum community users of TEI may represent important help in this work. This may be done by expanding the TEI standard with the added functionality you need and by publishing what you do and why you do it. You may also participate in the ongoing work to expand and improve the TEI guidelines.

Although the EAD is an archive standard, it is also used by museums, and should be considered seriously, especially when digitizing descriptions of archival material in museums.

The actual tagging

A tagged text consists of three distinct parts, as shown in *Figure 2*. One part is the source text. This should not be changed during the tagging process. The second part is the brackets, '<' and '>'. They are defined by the standard. The last part is the element names put between the brackets. They are the actual tags and are defined by you, although you may often choose to follow a set standard.

Fig. 2. The three parts of an XML tagged text. [Image file: eide_fig2.tif]

Although it is perfectly legal XML to just tag without any specification of the tags used, it is wise to have a data description defining the possible legal structures of the text. This is the XML DTD or Schema.[5] It is possible to define your own data description –and doing this is often a good way to analyze the text – but it is usually better to use a standard in the production work. A standard is a great help in structuring the information in a well established way, and it gives you easier access to assistance from experts – you can read what they have written, and they often answer direct questions on mailing lists. This also opens up a world of information exchange. Your texts can be further studied by others, and you have access to texts made by others in the same format as you are using yourself.

The structure of an XML document can be expressed as a tree. Take for example this document fragment:

    <collection>
    <record>
        <artefact>Stone axe</artefact>
        <location>Box 1</location>
    </record>
    <record>
        <artefact>Sword</artefact>
        <location>Box 3</location>
    </record>
    <record>
        <artefact>Gold ring</artefact>
        <location>Lost</location>
    </record>

The tree representation of the fragment is given in *Figure 3*. The tree structure makes it quite easy for computer programs to handle XML documents, for validation, searching and updating. The only problem with this is that not all texts fit into this kind of structure. Below is an example of overlapping elements:

    * This person was <name>John Peter <italics>Hanson</name>, son of <name>Hans Johnson</name></
    italics>, ...

This is not well formed XML, because the italicized element starts within the first name element, but ends outside of it. This illegal XML could not have been expressed by a tree structure.

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[5] The difference between the DTD and the Schema is syntactical. Further, there is a possibility for stricter definitions of the contents of the elements when using a Schema.
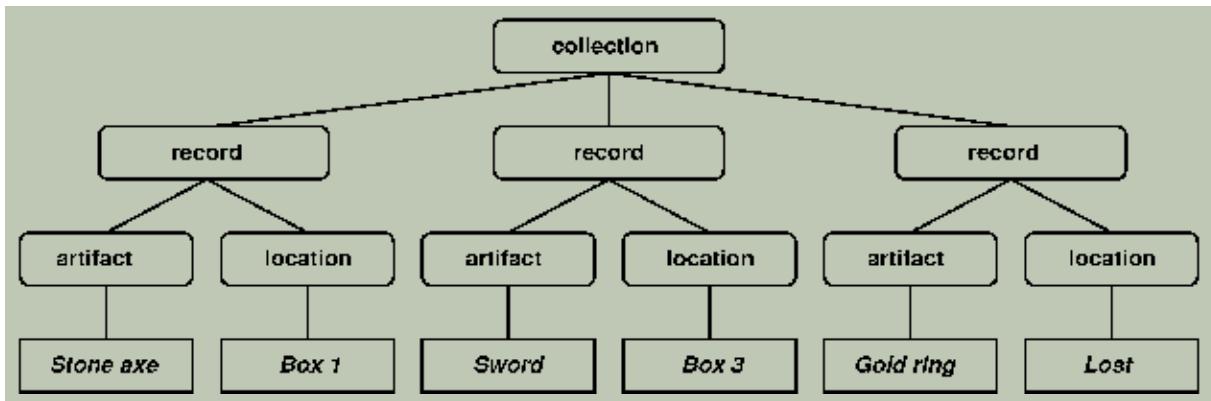
Fig. 3. The elements of the XML document forms a tree. [Image file: eide_fig3.tif]

There are several ways to get around this. One simple solution is to fragment one of the elements. It is better to fragment the italicized element rather than the first name element. This is the case because the use of the information concerning italics in an original text would usually work well when it is fragmented. A name, on the other hand, is a unit that should be kept together, e.g. for counting names of people in the text or for making a name list.

This person was <name>John Peter <italics>Hanson</italics></name><italics>, son of <name>Hans Johnson</name></italics>, ...

There are also methods for linking together fragmented elements if this is required.

Even though there are problems with the use of XML within the sector of cultural heritage, the advantages are more important in many cases, and as a result XML coding of documents has a strong position in many fields of study.

Validation

There are two levels of automatic validation that may be done using XML tools. If you do not have a DTD or schema connected to your XML files, there are tools that may check whether an XML file is well formed. This includes checking the syntax of tags and entities, that all elements are closed and that there is no overlap. When equipped with a DTD or a schema, the tools can in addition check that the structure of the document follows the one specified in the DTD or schema, including checking that the contents of elements are of the specified type. By using validation, many common human mistakes may be removed, but this does not secure that the right elements are used for the right kind of information. In order to reach that end, proofreading has to be carried out.

Tools

The number of tools available for creating and using XML is large, and it is still growing. The prices range from free of charge to quite expensive. In many cases, free software may do the job as well as or better than packages you have to pay for, but that depends on the work at hand. I will refrain from giving advice on what to use, but both the TEI website and the W3C website publish lists of software available.

Some of the tools may be set up to hide the actual tags from the user. Whereas not showing tags is obviously an advantage in the publishing of XML resources, there may be good reason to force the people creating XML documents to see them. At least someone in the organization should know what goes on behind the tag-free surface.

Application

In many cases the XML text is the end product. If the documents being digitized are printed books or letters, a web version of the documents is a good way to present the result to the public. A search interface should be added, at least with free text searching. You may also use the tags to provide more fine-grained searches, e.g. let people search in name elements only. The tags could also be used to provide the user with lists of persons, dates, occupations, etc. If geographical coordinates are connected to the individual place name, the geographical coverage of documents may be shown on a map. The Perseus Digital Library is one of the web systems using this kind of interface.

In other cases, data from the XML document is imported into a database. Then a mapping of the structure of the tagging, expressed in the DTD or in the XML schema, has to be made. Such a mapping could be quite simple, inserting the contents of each element into a column of a single table. It may also be a complex and expensive process if the structure of the XML documents is complicated.

Extraction: XSLT

When using XSLT, a new document is constructed based on the elements of the original document. To illustrate this, we will look at the collection record mentioned above. This XSLT makes an HTML document appropriate for publication as a list on the web:

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:template match="/">
<html>
  <body>
  <h1>Artefacts</h1>
    <xsl:for-each select="collection/record">
    <h2>
    <xsl:value-of select="artefact"/>
    </h2>
    <p><strong>Stored in</strong>:
    <xsl:value-of select="location"/>
    </p>
    </xsl:for-each>
  </body>
</html>
</xsl:template>
</xsl:stylesheet>
```

This results in an HTML document with a header level 1 'Artefacts'. Then, for each record element in the collection element, the contents of the artefact element is presented as a header level 2, and the contents of the location element is shown in a paragraph after the text 'Stored in: ' Thus, the body of the HTML version of this looks like:

```
<body>
  <h1>Artefacts</h1>
    <h2>Stone axe</h2>
        <p><strong>Stored in</strong>: Box 1</p>
```

```
    <h2>Sword</h2>
      <p><strong>Stored in</strong>: Box 3</p>
    <h2>Gold ring</h2>
      <p><strong>Stored in</strong>: Lost</p>
  </body>
```

Creating a file to be used for importing of the same data into a database, on the other hand, could be done with a stylesheet such as this:

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:template match="/">
<html>
  <body>
  <h1>Artefact table</h1>
  <table border="1">
  <tr><th>Artefact</th><th>Collection</th></tr>
    <xsl:for-each select="collection/record">
    <tr><td>
    <xsl:value-of select="artefact"/>
    </td>
    <td>
    <xsl:value-of select="location"/>
    </td></tr>
    </xsl:for-each>
  </table>
  </body>
</html>
</xsl:template>
</xsl:stylesheet>
```

This stylesheet creates an HTML table with one record in each row and a column for each of the artifact and location elements:

```
<body>
  <h1>Artefacts</h1>
    <table border="1">
      <tr>
        <th>Artefact</th>
        <th>Location</th>
      </tr>
      <tr>
        <td>Stone axe</td>
        <td>Box 1</td>
      </tr>
      <tr>
        <td>Sword</td>
        <td>Box 3</td>
```

```
      </tr>
      <tr>
        <td>Gold ring</td>
        <td>Lost</td>
      </tr>
    </table>
  </body>
```

This table may be imported into a database, or into a spreadsheet such as Excel, for further processing.

This small example shows neither the richness nor the complexity of XSLT. But I hope it shows a way in which the idea of 'one source, many outputs' may be used. It is important to remember, however, that the XML file is not only a format to be used temporarily in a process. It is also very well suited as a long-term storage format.

There are other alternatives to XSLT, among them programming language such as PERL or PYTHON, but these will not be discussed in this book.

Publication of digital resources

When primary sources have been digitised, they may be published. This can be done in the form of XML documents, using XSLT or other transformation tools. If the data from the XML files are imported into a database, this database may also be published, and this allows for an alternative way of creating search and browse interfaces, often more effective than searching facilities in the XML files.

When a new catalogue is created based on the existing sources, this may also be published, either as a set of XML documents or as a searchable database. It may also be published in printed form, if the institution finds that useful, in full or only in terms of excerpts. The catalogue may also be used as a basis for other types of presentations, such as catalogues with texts and images describing selected objects, in digital or printed form.

It is important, however, to be explicit about what you are publishing. Is it a search interface to a digital version of the printed catalogue from a particular year? Or is it a catalogue including the catalogue text for a selection of particularly interesting items selected by you? Is it an exhibition catalogue giving expanded versions of the descriptions in the catalogue, illustrated by drawings made by artists? All these types of publications are interesting products, but it is important not to give the wrong impression of the relationship between publications and its sources.

Error correction

It is obvious that as many errors as possible should be corrected in the catalogues that are published by a museum. There is no reason to publish records with errors if this can be avoided. But what about error correction when digital versions of written or printed documents are published?

These errors can be divided into two groups. Some errors are introduced during the digitization process. Consequently, the digital version is different from the paper-based original by accident. This kind of errors should be identified and corrected whenever possible.

Then there is the fact that there will always be errors in the original. If this type of errors were made when the writers of the original document thought that what they were writing was correct, the digital version should not be corrected. It should reflect the views of the original authors, whatever they were. These errors should be corrected in a new catalogue based on the sources, however.

But what if it is obvious that the author meant something else compared to the result in writing or print, by human or mechanical mistake? There is a considerable discussion among philologists concerning this – a discussion that I doubt will ever result in unison agreement.

One solution is to say that 'the aim is to make the digital version identical to the paper-based version'. Then the problem will be solved and that is the end of it. In many cases, the publishers of digital versions do not want to make the world that simple – for various reasons. In cases like these, when obvious writing or printing errors are corrected, it is important to consider and discuss the meaning of 'obvious'. This kind of corrections should also be recorded in the XML document.

Context

With respect to traditional archives, the users have to be present at the institution in order to make use of the material. This is, of course, impractical and expensive, and it is much better for the users to get access to material through computer networks. Still, a visit to the institution where the original documents are kept also includes visiting the people working there as well as getting easy access to other collections at this particular institution.

As discussed above, there are elements that cannot be converted into computer readable formats. In some respects we are breaking down traditional barriers, e.g. the barriers between printed books, archives and catalogues, in our digitization work. In the course of this process there is a risk that pieces of information may lose their interconnection and become meaningless. The publication of individual document collections and archives on the web may result in a kind of fragmentation because the user loses the context that used to surround the documents and archives.

By pointing to other sources of information, electronically available as well as paper-based, contexts may be rebuilt, contexts that are similar to the old ones as well as new sets of contexts. These contexts will be new in their appearance, but should carry with them the best traditions from the old institutions.

Staffing

In many digitization projects, the required work may be done by people already working at the institution. This is a good solution with respect to many smaller institutions because you can keep the costs down, although this may mean putting other work aside. As the staff at the institution knows the collections and the routines well, this will reduce the training needed compared to hiring people from the outside. If this approach is chosen, it is important to manage the project firmly, in order to prevent that the project work 'floats away' because of other tasks seemingly more urgent.

But often, additional human resources are required. There may be a need for a special kind of expertise or, more often, there is a need for more time for all the digitization tasks.

In the organization of this kind of project, you will need to have people with good computing skills, information management skills and skills of the subject field. But often the actual digitization work can be done by people without specialist training, as long as they are accurate and respect the value of the material. Management is vital, especially when people without previous experience are trained for this kind of work.

To build a new database, on the other hand, you need people with thorough knowledge of the subject field, of the history of the collections and of the material being digitized, in addition to computing skills. Often you have to set up a group of people to cover all these skills, and some of them may have to be hired from commercial companies. I advise people to be careful when setting up contracts, in order to avoid giving up your right to complain or having to accept unlimited delays without compensation. It is

often a good idea to pay a lawyer to go through the contract for you, and this may turn out to save you time and money later.

In addition to the traditional hiring of people, various other groups may participate in the digitization process, such as students, unemployed people on employment programs, or volunteers (e.g. members of 'friends of the museum'). Although this may save you a considerable amount of money, it puts greater demands on the management of the project as it is more difficult to instruct people who are not regular, paid employees.

In some cases, large parts of the digitization projects may be outsourced. This may be economically rewarding, and it may put less pressure on the organization, as someone else takes care of everything. One risk is that the employees may feel less ownership towards the end result compared to what they would have done after a process where they have been more directly engaged in the work. And, as already said, good contracts are of crucial importance.

Conclusion

I hope that these few pages have pointed out some of the important questions that should be considered at an institution when discussing digitization and the creation of computer-based catalogues. I also hope that the reader has found some interesting ideas concerning possible ways forward with their work. To conclude, I would like to advice against two traps that are quite common in this field of work. The only way to avoid them is an awareness of and a consideration for your methods.

The revision trap

'We really were digitizing, but we thought we would just fix a few errors...' During a project where you have decided to digitize old sources, and not to create a new catalogue based on the old one, it may still be tempting to start fixing small, obvious errors. Digitization may be compared to drawing the curtains in a dark room. As the sun brightens up the room, the dust that you could not see in the dark becomes very visible. It is, of course, tempting to do something about it, especially for experts in the field. But this leads both to a breakdown of the time schedule and a mixed result which is not, as planned, a digital version of the paper-based original. This is one reason why unskilled employees are often better at pure digitization work than experts. They know that they must refrain from improving the contents of the material. I recommend that you save the experts for the next stage, i.e. the establishment of the new catalogues based on the digital versions of the paper-based sources.

The quick & dirty trap

'Well, the board demanded a solution, but we did not have the resources to do it, and they only look at the surface anyway, so...' As long as you use very little resources, doing this is not a big problem. But once you actually start spending time and money on solutions that you have not considered thoroughly, you easily bind yourself to solutions that may lead you into increasingly more trouble. Eventually it becomes increasingly difficult to change the direction of the project due to the resources invested in the project. It is important to handle professionally any demands coming from the board or the owners and convey to them that there are no cheap and good solutions, as well as the consequences of choosing a cheap and bad solution. Like all curatorship, this is often difficult, but it is part of the job.

Resources

CIDOC-CRM web page: http://cidoc.ics.forth.gr/index.html

EAD web page: http://www.loc.gov/ead/

Eide, Ø., 1998. 'The Quest for Re-Integration : Creating New Documents across Traditional Borders' in C. Moring et.al. (eds.) *Shaping the Knowledge Society*, Copenhagen: Royal School of Library and Information Science, pp. 280–291.

Eide, Ø, 2000. Rapport : Manuskriptprosjektet ved Senter for Ibsen-studier. [Report : The Manuscript Project at the Centre for Ibsen Studies], Oslo: Universitetet i Oslo, Senter for Ibsen-studier.

Eide, Ø & Holmen, J. & Ore, C.E.S., 2003. 'Documenting two histories at once. Encoding text and performing archaeology on archaeological texts archives' [Conference paper]. Digital Resources in the Humanities, Gloucestershire.

The Perseus Digital Library web page: http://www.perseus.tufts.edu/

TEI web page: http://www.tei-c.org/

Tweedie, F.J. & Bank, D. & McIntyre, B, 1998. 'Modelling Publishing History 1475–1640: Change Points in the STC' [Conference paper] ALLC/ACH, Debrechen.

W3C, Homepage of the XML family of standards: http://www.w3c.org/

An XML tutorial page (there are lots of them, this is but one example – but it is quite good): http://www.w3schools.com/

How to Find and be Found on the Internet

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Some Internet figures

'There are three kinds of lies: lies, damned lies, and statistics' (B. Disraeli, UK 19th Century Premier). Market surveys state that the world population using Internet is quickly reaching the figure of 1,000,000,000 people. Of course, Internet users are concentrated in most developed countries, with about 1/3 in North America, 1/3 in Europe and 1/3 in the rest of the world. North America leads the ranking of penetration with about 70% of the population, followed by Oceania with little more than 50% and the European Union very close to 50%. Bulgaria and Romania almost reach 30%. (source: http://www.internetworldstats.com/stats.htm) By language, only 32% are native English speakers. 23% speak Eastern languages as Chinese, Korean and Japanese, and another 25% speak one of the Western European languages (Spanish – but these include also Latin America – French, German and so on). As of July 2005, there are about 3,000,000 top-level domains, with at least one site registered even in troubled countries as Sudan and Somalia and a .yt, in the small island of Mayotte, the only one of Comores still a French territory. Only Congo, Sierra Leone, Zaire, Eritrea and Yemen are the sovereign states with no registered domain. And how much information is there? A study of 2003 (http://www.sims.berkeley.edu/research/projects/how-much-info-2003/) estimated that the World Wide Web contained about 170 Terabyte of directly accessible textual content (17 times the content of the Library of the Congress), increasing at a rate of 0.1 Terabyte per day; 75% of it is in English. To this, the content of Internet accessible databases must be added (estimated size 400 times as much). It is not surprising that in the same period (early 2003) there were 250 million searches per day on Google, accounting for about half of all the searches on all search engines. Probably, by now Google's share has increased.

All the above figures are probably inaccurate and authors admit that at best, they are 'educated guesses'. However, they show that the amount of information out there (and within easy reach, just a few clicks) is unimaginable and is continuously growing. Also for this reason, only seldom one type the URL in the browser address field to access some information on the Internet, Following a link from a site is a little more common, but the typical way of accessing information is using a search engine, Google being the most popular of them.

The quest for Cultural Heritage

Is cultural heritage less popular? Not at all. The search term 'Cultural heritage' gives over 63,000,000 results (one year ago, in a similar experiment, they were 'just' 58,000,000), with UNESCO ranking top – the actual position depends on what Google decides it should be ranked first according to the user's country and profile, in this case the English version of the browser ranks an Australian site third – but also unexpectedly showing in the topmost positions a Lithuanian (private) site, one related to the Iranian Cultural Heritage & Tourism organization (with the English version still not working, as one year ago) and one promoting hotels and trips in India.

This experience shows that:
• The selection criteria sometimes do not show relevant web pages because they are 'similar';
• The ranking criteria are reportedly based on an 'honest and objective system'. We have no reasons to argue against Google's honesty, but it is clear that it tries to figure out what may be relevant for the user and orders results accordingly.

In its efforts to be friendly, Google may be indeed particularly annoying when ranking the results, for example when using an Italian version of Google, but still searching for the English expression, the resulting ordering is different from the above one.

Anyway, Google's list continues with a cocktail of relevant and irrelevant sites. Among others, in a mixed salad of large national or international institutions, local initiatives and some commercial sites, high in the list there are a completely useless Italian site pretending to be a Cultural Heritage portal but in fact just an amateur list of links; the site of the NINCH initiative – very interesting, but apparently last updated in 2003; and the site of a nice Black choir from the San Francisco area, with phone and emails to book the singers and an e-commerce page to buy their CDs.
The result of the first 20 web pages selected by Google for 'Cultural Heritage' is more humorous than discouraging. All cultures are equally important, but the Google ranking of countries is at least bizarre. The claimed effectiveness of PageRank, Google's search/ranking algorithm based on page importance as number of links referring to it, here fails completely, unless there are thousands of links to the small and remote countries appearing in the first pages, and leaves us almost alone with literally millions of pages to test.

Conversely, if one is creating a web site on cultural heritage, which tricks may rank it high so that it is easily detected? Apart from pretending that the heritage it deals with is located in Pakistan or Iran to profit of Google's nationality preferences, or use Farsi or Lithuanian as site language, there is little to profit of the indexing/ranking system of Google that works, as we have just seen, under mysterious – but 'honest and objective' – rules.

To be honest, as Google rules pretend to be, it must said that re-doing the same search after some months may lead to completely different results – for example one year ago the Indian Delegation in Botswana had an unexpected and possibly unjustified first-page ranking – and they differ also between two machines performing the search at the same moment, using browser versions that differ only in the language. It is a general proviso that any statement about Internet is destined to become obsolete in short, for the ever changing nature of the Net compared to persistent nature of printed matters. However it does not seem that changes have improved too much the above search results.

From another perspective, does the ICOM-promoted '.museum' domain help in distinguishing at least museum sites from other mixed stuff? The list of .museum domain names managed by MuseDoma, the organization assigning such domain names, does not include prado.museum, uffizi.museum, or hermitage.museum: the latter two lead to a page stating that such domains are 'not in use', whatever this may mean. For France, the Louvre is not listed, although there is somewhere a bizarre reference to musee. du.louvre.museum – yes, 3 dots – but one can get some consolation from the museum of Cointreau, the well-known orange liquor made in Angers, France, which leads the list of French institutions, hopefully for alphabetical reasons. Romania, Bulgaria and Hungary do not appear in the country list of .museum domains, which seems to have little popularity outside the Anglo-Saxon world and in any case to be much more dependent on curators' individual tastes than on widely accepted policies.

In conclusion, it appears that dot-museum: i) includes in fact only museums; ii) does NOT include all museums, and some very important ones are out – they did not even care of getting a .museum domain and then re-direct the address to their usual web site: for example, re-direct the non-existent (or, according to MuseDoma, 'not in use') www.uffizi.museum to the existing www.uffizi.firenze.it; iii) as it is, it helps very little to find, and be found, on the Internet.

The previous light-hearted survey leads us to a conclusion. Don't worry too much about being found on Google. Create an honest and serious web site, containing useful information and conforming to the most accepted guidelines for cultural web sites, and visitors will come. Fortunately, as shown from the success of Wikipedia, the law of large numbers is more honest and objective than search rules, and in the long run a 'good' web site will be visited as it deserves.

'Good' cultural web sites

Guidelines for good practices in the creation of cultural web sites have been investigated by researchers and by European projects. Among the latter, Minerva (www.minervaeurope.org) has produced a report on the quality of cultural web sites and also EPOCH (www.epoch.eu) has published a report, available online for download, on good design of cultural applications. Academic research has concerned evaluation criteria for existing museum web sites, which in some tests have not obtained good marks, with a few exceptions.

After a first season in which all cultural institutions wanted to go on the Internet without clear design ideas, it is now time to shift from 'just presence' to 'qualified content'. Internet presence must now be considered the first step to virtual, i.e. immaterial, cultural content, which complements and explains material heritage as represented by museums, monuments and sites.

Apart from administrative, logistic and advertising aspects – which are nevertheless very important aspects to attract and facilitate visitors – Internet and its virtual extensions offer a unique opportunity to communicate heritage and to interact with the public.

On the other hand, digitization policies at a national and European level are going to provide an unprecedented amount of cultural content available on-line. The so-called i2010 Digital Libraries initiative (http://ec.europa.eu/information_society/activities/digital_libraries/index_en.htm) is pushing for making 'Europe's Cultural and Scientific Heritage [available] at a Click of a Mouse'.

However, for such a content to be really available it is necessary to take some cautions.

Moreover, it is important to notice a substantial difference between digital libraries and virtual museums. Digital libraries are organized collections of digital content, with tools for searching and accessing it in an effective way, designed for optimal storage and retrieval. Virtual museums add on top the interaction with the user. A museum (virtual or traditional) cannot limit to preserve artifacts: it must attract visitors, tell them stories and communicate its cultural content in an attractive, interesting and culturally valuable way. Therefore, virtual museum must be designed having visitors in mind and putting their interest in the center. A librarian's attitude states 'I must keep and preserve this cultural content and make it available to users when they ask for it'; a curator should add '… and I must induce users to ask for it'. But this is a matter of design and relates little to facilitate searching.

Making digital content really available

In the era of globalization, Internet provides content coming from the most diverse cultures, in many languages – in Europe there are 23 official languages and many more recognized at a national level, as Catalan or Gaelic – and with different quality. Leaving apart for the moment the issue of the reliability of Internet information, all policies on digital assets stress the importance of preserving the richness of multi-culturalism and multi-lingualism, to avoid the cultural flattening which is often associated with the concept of globalization. However, even in a mono-lingual world, information is still organized in a chaotic way, because providers arrange their data in the way which appears to them as the most useful for their individual goals. This leads to a huge amount of digital legacy archives which are usually not interoperable, i.e. cannot be accessed as a whole. In the pre-Internet era, this was not really a problem, although homogenous data were required, and rules dictated, when off-line consolidation of archives was planned, for instance at a national level. On the contrary, when all digital assets are jointly published and are simultaneously accessible, any incompatibility among them is a big concern. So, to be really useful for any digital collection to be published on the Internet it is necessary to plan carefully its conformance to data organization and technological standards, the vocabulary it uses and the compliance with existing or forthcoming search tools. This is not the case for text pages, although even here normalized usage of preferred terms may facilitate searches a la Google. Standardization is on the contrary paramount

whenever a database is designed. Sooner or later, such an archive will be made available on the Internet, and it is wiser to organize it in such a way that future online migration is not hampered by short-sighted design.

For the archaeological sector, a precursor of the interoperable approach was ARENA, a now concluded European project (ads.ahds.ac.uk/arena/). ARENA succeeded in enabling searches through selected archives from six different countries.

Standardization in documenting heritage has thus received new energy from the digital library perspective. Surveys, reports and links concerning standards can be found on the EPOCH site. The project has developed a soft approach and tools to facilitate the adoption of standards in digital cultural, and bypass the difficulties deriving from uncontrolled growth, limited skills, existing habits and national regulations, sometimes forcing the adoption of systems that are not designed to be compatible at an international level. It is hoped that the combined effect of standardization and digitization policies will increase accessibility to culture and spread it widely among citizens.

In conclusion, when planning the creation of a digital cultural archive, take into account the implications of guaranteeing online interoperability: a little effort today may save time and money tomorrow. If you already have valuable digital assets (most digital archive are such), consider the opportunity of publishing them online availing, for example, of the EPOCH standardization and publication tools. This will increase your visibility while providing a useful service to the scientific community.

Conclusions

The above quoted MINERVA and EPOCH web sites provide additional information, documentation and links, so it is unnecessary to give here references or directions for further work.

In the ever changing world of the Internet, no stable conclusions may be easily drawn. Probably, the secret of succeeding in being noted still remains being notable. This results from the balance between being unique – so that people is interested in the information provided, because they cannot find it elsewhere – and being common – so that the information provided fits well with other available information to build new culture. On this regard, technology must be handled with caution: poor content cannot be substantially improved by powerful technology, but poor technology can impair even the most interesting content.

3D Modelling and Virtual Reality
for the Archaeological Research and Museum Communication
of Cultural Heritage

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'...Imagination, or visualization, has a critical role to play in scientific investigation...'

René Descartes 1637

Introduction

Virtual Reality (VR) and Three Dimensional (3D) modelling projects involving archaeological data are known as early as the end of the eighties; during the nineties the field gradually advanced resulting in new models and new projects virtually reconstructing archaeological sites, monuments and artefacts, concluding the work of the nineties with several major publications summarizing theoretical aspects and practical work in Virtual Archaeology (see selected bibliography). These years saw also the first attempts to establish standards and propose methodologies for the use of VR and 3D modelling techniques into archaeology, particularly the communication of data by the means of these techniques, the historical credibility of VR and 3D products, the accuracy of the products from an archaeological point of view or the need for a transparency of data. Since the new millennium until today, communication of VR projects is constantly increasing. A clear trend was noted among these projects, most focusing on two major subjects: communication of Cultural Heritage to the public and presenting new methods for improving the quality, from an artistic or computer graphics point of view, of the VR product. Thus, there is a large bulk of information (more than a hundred articles) dealing with various aspects of VR and archaeology, but mostly regarding different aspects of computer graphics innovations and on-going projects concerning the presentation to the public of CH using VR and 3D models. Consequently, there are very few debating methodological and theoretical aspects of VR and 3D modelling applications in archaeology, and even less articles presenting new insights into the archaeological research using VR and 3D models as an investigation tool to solve archaeological problems. Therefore, after some five years that witnessed a boom in VR and 3D modelling projects relatable to archaeology, but few to none impact on the archaeological research, several questions are raising: should archaeologists bother at all with VR and 3D, beyond occasional consultation on the 'credibility' of the VR model (the archaeologists serving as a authentication tools – 'the model is archaeologically proven')? And what is the gain of the archaeological research from VR or, more strongly emphasized, why should archaeologists deal with VR and not leave it to computer graphic specialists? One obvious answer lies in the must of any research result to be communicated to the public, and VR and 3D modelling has proven itself as a most efficient tool for education and communication of Cultural Heritage, as seen in the many projects and papers dealing with these aspects presented at the CAA and VAST conferences and at others as such. But are the first primary parts of any communication process of a scientific result, i.e. the scientific research itself, which, as argued in this paper, can greatly gain by adopting VR and 3D modelling as a daily tool in the investigation of human past activity and its context. This aspect may be linked to a more general question, regarding the role of the archaeologist (beyond the obvious motivation – excavating is fun!) and his efforts in reconstructing aspects of the human past life from cultural material remains and their natural context. And precisely in this niche VR and 3D modelling can greatly contribute, by visually expressing alpha-numeric

data and by graphically expressing thoughts and ideas, and translating '…empirical phenomena into geometric language…' (Frischer *et al.*2002:11). This aspect was summarized by Niccolucci (2002): '…since interpretation, explanation and communication involve reasoning, Virtual Archaeology can provide virtual creations to organize and synthesize known facts, showing them with greater clarity to others or to one's 'inner eye', or virtual substitutes of physical objects…' (Niccolucci 2002:3).

   The following paragraphs will present some basic concepts on what is VR and 3D modelling and how they can contribute to the archaeological scientific process of understanding human past life.

Virtual Reality and 3D models –basic definitions and applications to archaeology

A simple definition of Virtual Reality is: '…the simulation of a real or imagined environment, experienced visually in three dimensions…'. In order to understand, represent and analyze the complexity of the real world, people draw pictures or build abstract descriptions, or **models**. By selectively and carefully omitting details and including relevant factors, a model can provide a useful tool for understanding a particular problem or predict the behavior of a particular phenomenon. A model has a value only when it can provide insight on some situation, (answer a specific question), and the model is analyzable, *i.e.* accessible to critical evaluation.

   Thus, from the definition themselves, one may see the potential of applying VR in archaeology, since in order to understand a past human activity, we must imagine it, and thus reconstruct its context, be it the environmental, anthropogenic or social. Once this context is made visual, it is mobile, immutable and reproducible. Moreover, researches in cognitive psychology have shown the positive relationship between the visualization ability (the ability to manipulate or transform the image of spatial patterns into other arrangements) and the use of visualization tools and thus perceiving the information in a more appropriate way. The implication is the better the visual tool, the better the explanation and the interception, in our case of the archaeological information. Consequently, virtual reality allows the 3D visualization of concepts, objects or spaces and their contextualization – it gives a visual framework in which data is displayed. The example is *Figure 1* demonstrates the difference between a traditional and a 3D presentation of data (in this case, a roman military camp at Avdat, Israel).

   Being interactive, the 3D model can be rotated, all its views (above – traditional, side – stratigraphic, inside of structures) being analyzable and thus while keeping the traditional presentation, additional data is incorporated within the same illustration: height of buildings, shape of towers and their height (and thus the visual range of soldiers on guard). A further question deriving from the 3D visualization of the military camp could be an estimation of its spatial organization, in terms for example of economy
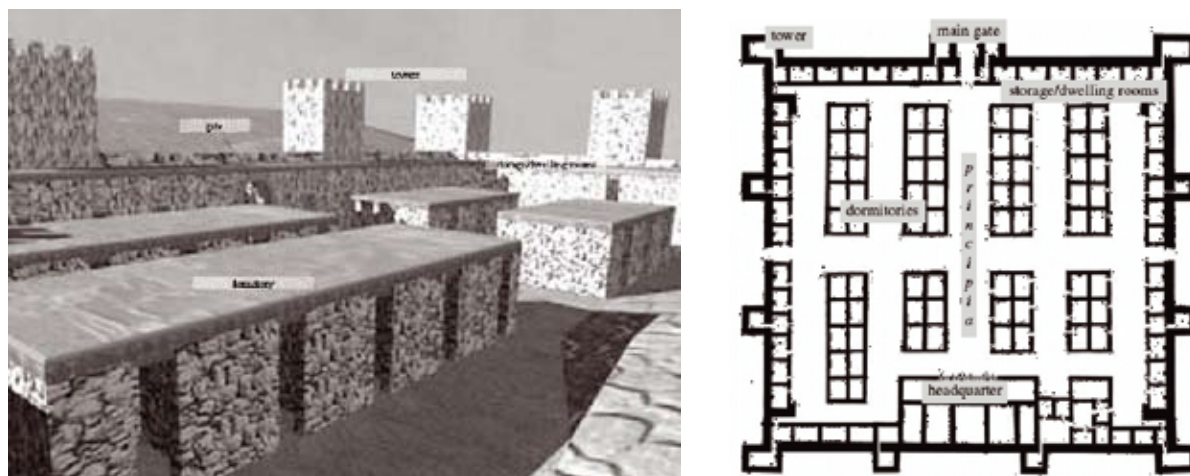
Fig. 1. Plan of the military camp at Avdat (after Hermon and Fabian 2002)

of movement in case of emergency – the model can be populated with soldiers running from barracks, climbing the ladders and readying for battle. Thus, important aspects, such as efficiency of spatial organization can be posed and resolved by using the 3D representation of the camp.

3D visualization is also an invaluable method of turning data (obtained during the excavation, survey or investigation of the archaeological site) into information, ready and available for further study and investigation, and into knowledge, communicating the results. In this context, VR enables interaction with data organized three dimensionally, facilitating the interaction human – data. A key issue of visualization is related to its potentiality in facing, accessing, managing, interpreting and sharing increasing amounts of information being generated by any (including archaeology) scientific field. *Figure 2* exemplifies the above made statement. The displayed environment is based on the results of geo-morphological and geological studies (estimating the erosion degree and thus the shape of the valley where the habitation is located), palynologic and palaeo-botanical studies (in order to reconstruct the vegetation), both being related to palaeo-climatic studies, in order to reconstruct the environment's ecology in a given period of time (by radiometric dating methods) and finally the human remains in this natural context (habitations being reconstructed on the basis of ethnographic comparison and subjected to architectural laws).

Another aspect of 3D visualization, exemplified in *Figure 2*, is the possibility of conversion of information not perceived by the human eye into forms suitable for it. Thus, a table which traditionally would include a list of palynological data is translated in *Figure 2* in a real representation of the vegetation that could raise additional questions regarding the relation human settlement and its environment, such as a visual site catchment analysis, exposure of habitations, closeness to forests, etc... Moreover, the ability of 3D visualization to simulate scientific phenomena, enabling the steering of experiments or simulations (based on scientific rules and constraints) as they happen, and the interpretation of accurate predictions or numerical simulations, may lead us to the investigation of new phenomena of the past under research and thus visualize results of hypothesis and predictive modelling. Turning back to the example in *Figure 2*, simulations of amount of available land for agriculture, (and subsequently the amount of labor energy invested in deforestation would lead to an estimate of the population of the archaeological site under research and its subsistence economy.

Figure 3 further exemplifies the capability of 3D visualization to converse information not perceived by the human eye in forms suitable for it, susceptible to scientific interrogation.

Plin. N. H. XXXVI. 18.4.– '… *Namque et Italicum (labyrinthum) dici convenit, quem fecit sibi* **Porsenna rex Etruriae** *sepulcri causa, simul ut externorum regum vanitas quoque ab Italis superetur. Sed cum excedat omnia fabulositas, utemur ipsius M. Varronis in expositione ejus verbis:* **Sepultus est***, inquit,* **sub urbe Clusio***; in quo loco monumentum reliquit lapide quadrato: singula latera pedum*

Fig. 2. Reconstruction of the environment of an archaeological site (after Negroni Catacchio and Cardosa 2001)

Fig. 3. Virtual reconstruction of Porsenna's mausoleum

lata triennium, altar quinquagenum; inque basi quadrata intus labyrinthum inextricabilem; quo si quis improperet sine glomere lini, exitum invenire nequeat. Supra id quadratum pyramides stant quinque, quatuor in angulis, in medio una: in imo latae pedum quinum septuagenum, altae centum quinquagenum: ita fastigatae, ut in summo orbis aeneus et petasus unus omnibus sit impositus, ex quo pendeant exapta catenis tintinnabula, quae vento agitata, longe sonitus referant, ut Dodonae olim factum. Supra quem orbem quatuor pyramides insuper, singulae exstant altae pedum centenum. Supra quas uno solo quinque pyramides; quarum altitudinem Varronem puduit adjicere…'.

The Latin text narrates Pliny the Elder's description of a mausoleum apparently built by Lars Porsenna, last of the Etruscan kings and ruler in Clusium (modern day Chiusi, Tuscany). Pliny quotes an earlier historic source (Marcus Terentius Varro) to describe the huge mausoleum, apparently destroyed by an earthquake in the 5th century BC, its traces being completely erased in Pliny's time, the last century BC and the 1st century CE. Even if one may doubt the historical credibility of the narration and may perform a throughout historical research, combined with archaeological excavations (no remains whatsoever have been found in the area), without doubt the virtual reconstruction of the mausoleum and its scientific analysis would clarify many aspects of the historical text.

The accuracy of Pliny's description, with all details and parts of the mausoleum accurately provided (including sizes and raw materials), enabled a detailed virtual reconstruction of the monument (*Figure 3*). Consequently, the model can be subjected to a minute architectonic analysis (static and dynamic laws), in order to estimate the plausibility of the reconstruction, and alternately, what would have been a reasonable monument, given the soil characteristics, building materials and engineering knowledge of the period. Moreover, other research questions can be posed: if the monument existed, what could have been its location? The Latin text explicitly notes that the monument was 'under the city of Chiusi', which lead to many legends regarding labyrinths and hidden treasures in the many underground passages that still exist today, cutting the city's old centre undergrounds. However, a monument of such a size (some 190 in height, by far the largest monument in antiquity) was located outside, possibly in a valley outside the city, under it in terms of altitude. Thus, the visualization in 3D of the historic text of Pliny the Elder, enables its authentication as a historic source, at least from the physical possibility of its existence, its material form and its spatial localization.

Quantifying contingency of VR and 3D models

There are some basic requirements from 3D models, in order to be accepted as scientifically valid. Their resources and the criteria on which they are based should be explicitly presented and open to a critic evaluation. Alternate reconstructions should be made available to the user. *Figure 4* shows an example of typical stages of a 3Dmodel building and its basic components.

A virtual representation of an archaeological concept, object or monument is build upon data originating from various fields, such as historical sources, which can be ancient maps, drawings or other graphic representations (including paintings, mosaics, etc.), texts or quotations from other texts, it may derive from archaeological field investigation (surveys, soundings or excavations), comparative studies, and, not less important, the imagination of the modeller, based on his/her accumulated knowledge. Thus, the model is expressed as an equation with several variables (field data acquisition, historical sources, imagination, etc.), these in their turn being influenced by other variables (such as accuracy of measurements, reliability of historic texts or ancient maps, etc.), usually without a defined inter-relationship. Apparently, the 3D model is a function with an unknown syntax, un-quantifiable variables and a final value independent of its variables.

In order to estimate the reliability of the model and allow its (virtual) de-construction for a critic evaluation, it is important to represent the various steps that lead from the first draft of the model (M_0 to the final model M, or alternatives – M') (*Figure 5*).
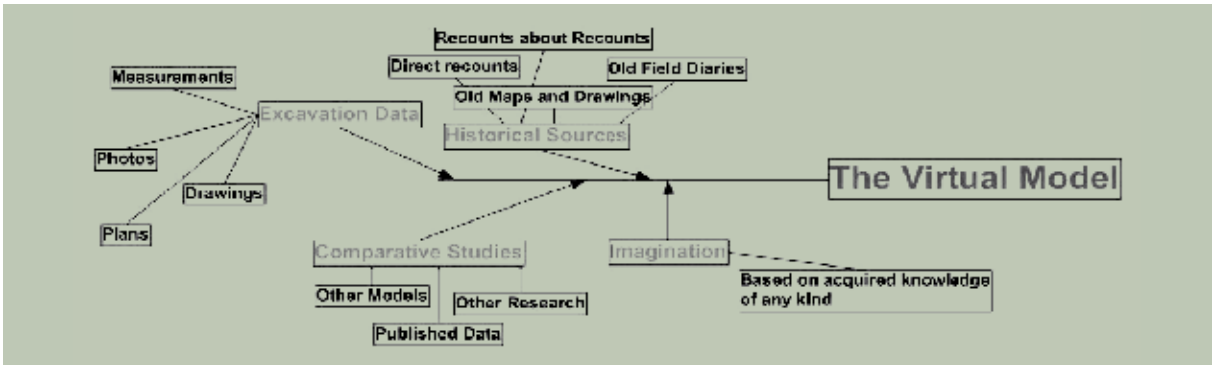
Fig. 4. Schematic diagram of a 3D model building stages (after Niccolucci and Hermon 2004)
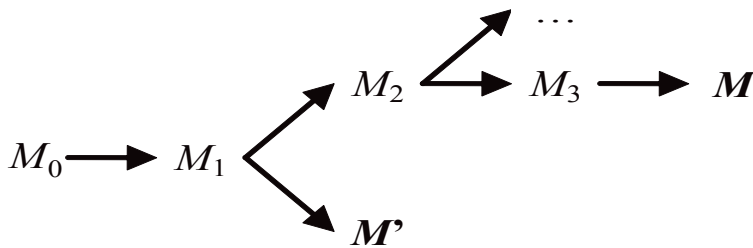
*Fig. 5. Schematic representation of the process
of building a 3D model*

Thus, each M_n model is the union of the preceding models, in a determined mutual position, each previous step having its geometry, material and unique spatial position. The process ends when the model satisfies our needs (ideal model), there are mo more resources to be incorporated or we run out of time or resources (commonly occurring). *Figure 6* exemplifies the process described above. We start with an M_0 model, based on the existing structure in modern times; considering the amount of fallen stones, historical sources

*Fig. 6. 3D model and alterative model
(after Niccolucci and Hermon 2004)*

and comparisons with other similar structures (in this case a church tower bell of the 12th century), we reconstruct the entire structure, offering two relevant models (M_n and M'), one representing a version of the tower with a double function, as a defense building as well (M_n), while the other (M'), representing the tower as a regular bell-tower. Note that in both models there is a clear distinction between the reality and the virtual (the oblique line dividing between what exists in modern times and what has been virtually reconstructed).

Thus, for each step in the reconstruction, its metadata has to be presented (sources and their reliability), in order to secure the data transparency and thus to satisfy the scientific requirements from the model. Moreover, the relationship between the archaeological and the virtual realities should be explicitly presented, drawing the boundary between these realities. A threshold slider can be installed on the display system, allowing the user to choose how much reliability he/she wants to be displayed (ranging from the archaeological reality – 1, to pure imagination of modeller – 0). Other solutions would be the representation of uncertainties as ghosts, alternate models with fading colours, etc.

Visualization tools and basic requirements

Visualization tools may roughly divided into two main groups: interpretive and expressive. The first group of tools helps users to view and manipulate visuals, extracting meaning from the information being
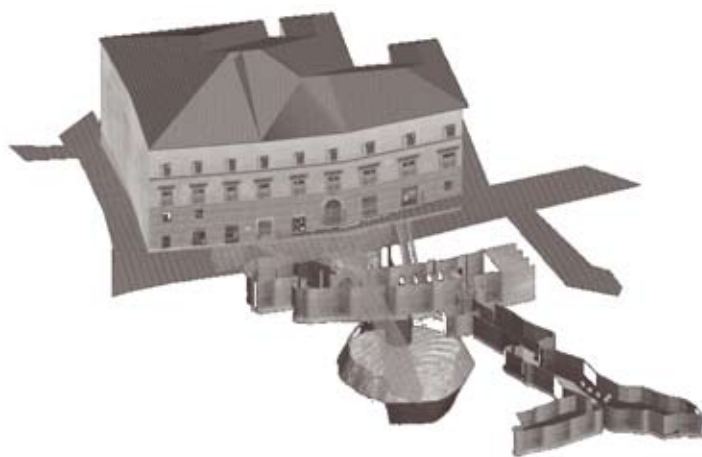
Fig. 7. Virtual reconstruction of the underground Etruscan water system at Chiusi, Tuscany

visualized; they help to clarify difficult-to understand and/or abstract concepts, making them more comprehensible. A simple use of (3D) visualization as an interpretive tool is exemplified in *Figure 7*.

The image represents a vertical section through the old centre of the town of Chiusi, in southern Tuscany: the large building is a 16th century palace; through its cellars, some of the medieval periods, one may access to a series of underground tunnels and a complex water system from the Etruscan period. The user may investigate the superposition of the various strata and thus follow the urban development of Chiusi, by analysing the 3D model of *Figure 7*. Moreover, the information regarding the Etruscan water system, its tunnels and the subterranean lake, may be used to investigate upon the water system in the following periods and consequently the development and the changing in techniques through time. The same represented water system may be used to understand the ancient Etruscan technique of water supply to the town, by simulating the entire process of digging the tunnels, their inclination, probable length and height, the amount of accumulated water in the cistern, and so on. *Figure 7* is also an example of visualization of a series of underground structures, most close to visitors; thus, the user may have a realistic image of the entire underground system and analyze it entirely, from various angles, being able to select parts of it, or the entire complex, within its spatio-temporal context

Expressive visualization on the other hand helps to visually convey meaning, in order to communicate a set of beliefs. In this sense, visualization uses designed representations in order to simplify the process of understanding.

Figure 8 illustrates a screenshot from a dynamic elevation model representing a part of the Tuscan coast, which suffered major changes through the Quaternary, culminating in modern times to the formation of a lake (Prile), where once an open sea and a bay existed. The model exemplifies the relationship between the changing landscape and the human settlement pattern, and the subsistence economy of the inhabitants. The modern coastal line is expressed as a line connecting the two parts of the once bay; the human occupation sites are represented as spots that appear according to their temporal position (from the Upper Paleolithic to the Roman periods).

Once the visualization tools have been defined, there are several ways of how to best benefit from them (or, in other words, how visualization contributes to our manipulation of data, in order to transform it into information):

1 **selective emphasis** – allows the user to detect, identify and visualize hidden patterns, by highlighting or hiding some parts of the visualized data.

The example in *Figure 9* illustrates the use of selective emphasis of visualization tools – in this case, a flint tool (shown in the right side of the figure), depicted only by their contours in the left figure, in order to evaluate the regularity of the edges of the tool, an important attribute when classifying these objects. Thus, the contour can be processed and further transformed into a mathematical formula enabling a fast and reliable classification of objects, according to pre-definite criteria (such as regularity of edge, shape of ends, etc…), a process that is done usually manually in the lab, requiring a much longer time that the computer processing; moreover, the computer classification would increase the reliability of the classification, being based on 'objective' criteria, *a priori* defined by the user.

Fig. 8. 3D model of Tuscan coast temporal development and settlement pattern (Ceccarelli and Niccolucci 2003)

Fig. 9. Flint tools and selective contour (after Hermon, Calori and Petrone 2001)

2. A second way in which visualization tools may help the archaeological scientific research is the **transformation** of non-visual data into a visual image by mapping its values into visual characteristics.

The example in *Figure 10* displays a simple representation of the spatial distribution of flint artefacts within the confines of a habitation area of a prehistoric site.

A simple superposition of a density map of the flint artefacts over the architectural plan of the site revealed important information, easily retrievable from the visualization of the image: the highest density of flint items is in close vicinity to a hearth, within the confines of a habitation structure, while open areas, which probably served as animal enclosures, are poor in terms of flint artefacts. Thus, numeric data (quantity of flints in each excavation square) was transformed into a distribution map and visualized superimposed on the architectonic plan of the site under investigation.

3. **contextualization** – is the provision of a visual context, or framework, within which data is displayed and investigated.

The example in *Figure 2* (discussed

Fig. 10. Spatial distribution of flint artefacts at a prehistoric site (Hermon and Rosen, in prep.)

above), is a simple example of how the human social interaction with the environment, the settlement pattern and its relation with its surrounding, the subsistence economy and many other aspects approached when examining the human settlement of an archaeological site are enhanced when provided the visual context of the subject under investigation (in this case, the archaeological site and its interaction with its environment).

Summary

The last decade has witnessed a constant growth in VR and 3D models applied to archaeology. However, despite the great potential of VR as a research tool, already applied in most disciplines, it had little impact on the archaeological scientific research, the latest developments in the field concentrating on improving computer graphics methods and artistic skills rather than adopting 3D modelling and VR in the archaeological reasoning process. Often, a typical question of archaeologists being confronted with a VR model would be 'how accurately it represents the archaeological reality', and if yes, it would follow an artistic evaluation of the product, and rarely 'how it can enhance my understanding of the past?'. This articles proposed to view VR as a tool, with its own methodology, that can greatly contribute to the archaeological research, having it position on the reasoning pipeline after the classification of the data and before disseminating the result – VR can be used as a medium for visually expressing numerical data, ideas and check hypothesis, gathering various data formats and giving them a visual form, analysable and subject to deconstruction. Moreover, in VR, one can freely move in 3D, but also in 4D, by creating predictive models or evaluating scenarios and alternative of past events, given particular parameters. In this sense, VR can serve the archaeologist as a 'time-machine', by visualizing the past environment (the archaeological world under investigation), and allowing its study 'from within', the archaeologist being an integrated part of the VR model, that represent his/her depiction of the past under scrutiny.

VR also facilitates the transformation of data into information and into knowledge; having no language barriers, (an image does not need to be translated), it sustains the communication between the scientific community and the dissemination of both the reasoning process (data transparency) and the final results in an easy to understand format.

Thus, a VR model, which can be viewed as a simulation of an environment, constructed with the meaning of shedding light on an insight of a particular problem or to predict the behaviour of a particular phenomenon, can be used as a research platform, where multiple format data are integrated into an homogeneous system which allows the creation of an integrated archaeological research framework.

VR and 3D modelling applications in museum environments

Three basic requirements describe Virtual Reality systems: immersion, interaction and visual realism. In the following paragraphs, each one of these characteristic will be summarized.

Since we, archaeologists, are trying to 'reconstruct the past', and archaeological museum display objects from the past, 'ripped' from their original space/time context, the users (museum visitors) must *'immerge in time'*, in order to understand the exhibited object and perceive them not as art objects but rather as artifacts with a history within a well-defined context (***look at the past with the eyes of a past viewer***). Visualization can be used as our 'time machine' in order to achieve this goal, through the reconstruction of the desired (past) scene, its population with virtual humans (optional), and the possibility of the user to interact with the ancient world reconstructed. Intuitively, or based on previous knowledge, the user (the visitor in the museum) will be able to experience actions and see past environments. This 'time travel' could be performed either by changing the time scale, the visitor being able to discern changes through time in a delimited space, or, alternately, 'visiting' different environments in a given time slice. Possible, relatively simple and on-hand applications to achieve these products are game engines utilized to create interactive environments, either role games, or adventures, based on real events.

The ***interaction*** of the user with the virtual environment should be made as simple and as intuitive as possible stimulating the curiosity of the user and its willing to further explore the system, enabling the user a full transparency to the metadata. Needles to say, the interaction should be adapted to user needs and environment of the system.

The **level of trustworthiness** is measured by the capability of the system to display a clear demarcation line between the real and imaginative; on the same time, whenever different explanations of the illustrated phenomena are available, they should be displayed, the user being able to choose whichever version should be displayed. Moreover, each alternative visualization (model) should be complemented with the relevant metadata and a contingency evaluation of the version.

When involving VR and 3D models in communicating Cultural Heritage, it is important to trace down and define the inter-relationship that should exist between the information source (what is projected, transmitted: a movie, an interactive game, a film, etc), the interface through which the information is transmitted and through which the public interacts with the information (a computer mouse, a touch-screen monitor, a virtual theatre, an exhibition, etc) and finally the target public of the information transmission (a group of people, single persons, virtual visitors, etc). Needless to say, the location of the system (the exhibition space) is of particular importance (open/close space, size of space, luminosity of the ambient, etc), since it will have a strong influence on the way the information will be perceived by the public.

Thus, before starting to give shape to the information (build the Virtual World, the 3D model, etc), it is important to keep in mind who is our target receiver of the information, i.e. define the typology of the public, its age, its orientation and the type of interaction it will have with the information. In other words, one should perform an in-depth study of the user requirements and the best-suited way of interaction with the information we want to transmit, which in turns depend on the kind of information one wished to communicate. The next step is to assure the self-sustainability of the system; the system should require as little as possible the interference of technical specialists and should be easily managed by the museum staff.

When building up the information, it is clear that we should shape it in adequate terms for the target public, and in the same time maintain a scientific credibility; therefore, as much as the system enables, the metadata related to the data upon which we are creating our story and building up the information should be visibly presented, and a clear line dividing reality and pure imagination should be drawn.

Another key for the successful application of any VR project is the cooperation between the different actors involved in a project of this kind – a multi-disciplinary team, involving Cultural Heritage experts (archaeologists, historians, anthropologists, etc), museum curators, media and communication specialists, human-computer interaction professionals, etc. will assure an effective communication of the information and its transformation into knowledge.

A last comment – in past years several projects, researches, exhibitions, etc., employed in some way or another the use of VR and 3D modelling. Therefore, it is strongly suggested to perform a market study of what is available (technologies, hardware, etc), before paying large amounts of money in order to develop a product that you might discover it has been already produced some time ago and is applicable to your needs. A good place to start looking for projects is the knowledge repository of the EU funded Epoch project (www.epoch-net.org), aimed at communicating Cultural Heritage using Information Society Technologies. A summary of several showcases Epoch developed as examples of best practices in communicating CH is presented below. Other knowledge sources are detailed on the reference list at the end of the manuscript.

Showcase I – On-Site Reconstruction Experience

This showcase presents an Augmented Reality (AR) system to be installed in open-air archaeological parks. It enables visitors to experience virtual reconstructions of ancient monuments superimposed *in-situ*, through AR glasses or telescopes (*Figure 11*), on the real remains. Thus, the visitor may experience the original shape of the monument and its detail, within their original environmental context, and not on a computer screen within a museum (*Figure 12*).

Fig. 11. AR devices: binoculars, (left) and telescope (right), through which the VR model is superimposed

The optical tracking algorithm of the system is capable to identify the visitor's position among several pre-selected viewpoints. This facilitates the integration of real and virtual scene elements and enhances the comprehension of the visited site. The head motion of the visitor is tracked by the system and the reconstruction image is continuously adjusted to the actual field of view (*Figure 13*). The example shown is the *nymphaeum* (ornamental fountain) at the upper *agora* of the Hellenistic city of Sagalassos, about 100 km to the north of modern Antalya in Turkey.

Showcase II – Multimodal Interface for Safe Presentation of Valuable Objects

Many objects of art have an exceptional value, due to their uniqueness, exceptional craftsmanship, precious materials, historical significance, etc. Safely and effectively exhibiting such objects is always a challenge: maximum visibility to the public versus preservation against destruction. Moreover, objects contain a wealth of information such as symbolic or historical significance, not always apparent; indeed, exhibited object tend to be regarded as pieces of art, rather than artifacts with a particular story, within a given socio-cultural system. Considering the costs that are involved in transporting, displaying, safeguarding and maintaining the object, and the finite number of visitors who will view it on display, the number of people and amount of information conveyed about the object is relatively small. The potential audience is much wider and the range of information that is linked to the object can be greatly expanded through the use of digital technology.

The goal of this showcase is to create a presentation methodology that provides a viable alternative to displaying valuable original objects (*Figure 14*) yet provides a way of offering nearly unrestricted 'virtual' access and provides a compelling and innovative way to tell the story of the object for a general audience.

The showcase is based upon a replica of the object (*Figure 15*) which serves as the interface to explore the object. Through the use of an orientation sensor integrated in the replica, the object can be visualized on a computer screen in precise coordination with the angle it is held or rotated by the visitor/user. In this way, the user feels the shape and details of the object and sees the virtual representation of the object in the screen, behaving exactly the same way as the replica. By adding touch sensors to the surface of the replica in significant areas of interest, the user can explore the meaning of the object. Touching a selected feature on the surface of the replica brings up a story on the screen (*Figure 16*) that explains some facet of the meaning and history of the object. For example, if the object bears an inscription, the user can learn what it means, and what message lies behind it, by simply touching the text. This tactile interface allows visitors to experience and explore the object in an exciting and innovative way–that would certainly not be possible with the original artifact.

Fig. 12. Real image (left) with superposed image (right) in situ, as seen through the AR system

Fig. 13. Different viewpoints seen through the AR system

Fig. 14. The real object

Fig. 15a. Replica of the object, with touch sensors

Fig. 15b. Screenshots from the story of the object, as narrated by the system

Fig. 16. Screenshots from the storytelling of the abbey of Ename

This methodology is suitable for single visitors or families, but also for guided groups, as the visualization of the object does not require any special equipment or glasses. It is particularly valuable for people with various handicaps, such as blind persons, who can touch the object and hear a detailed description of the part under their tactile investigation. As duplication of the object is easy and inexpensive, copies of the virtual object can be shown at multiple locations in one exhibition or at multiple exhibitions at the same time.

Showcase III – Avatar based interactive storytelling

Storytelling is a familiar and effective way to convey information to a general audience, especially in the field of Cultural Heritage. Yet with the increasing use of standardized interactive applications in museums and historic sites, it is difficult to appeal to a wide range of visitor interests. This problem can be solved through the use of interactive storytelling, which allows the visitor to choose from a large selection of subjects and themes to create a personalized 'story', appropriate to his or her interests and the time available for the visit.

Presentation systems featuring interactive storytelling should be easy to update and maintain, without the expertise of technical specialists. Text-based interactive story telling applications, driven by a relatively simple XML or database application, allow museum and site staff to update the content by merely typing in texts. Recorded narration is generally more effective than text in conveying information to the visitor, but its use in interactive storytelling has a major drawback concerning updating: changing minor parts of the content requires major investments in time and money (studio recording sessions, editing, digitizing) which often results in discouraging frequent updates and jeopardizing the entire update process.

By adding synthetic voice capabilities to the interactive storytelling system, this problem of updating time and expense can be effectively addressed. Text-to-voice translation software makes it possible to create narration from the keyboard. Simple software tools can be used to alter intonation or stress significant words, making the synthetic speech more lifelike. The sound files can be easily exchanged in the application and they can provide narration in several languages.

An additional element can enhance the effectiveness of an interactive storytelling system: the use of avatars as personal guides and storytellers for each visitor. Interpretation specialists have long commented on the highly impersonal nature of the 'disembodied' narrator's voice. The use of an avatar (or multiple avatars) can provide a distinct point of view, attitude, and physical appearance to enhance effect of the interactively created story on the particular visitor or visitor group.

Showcase IV – Multi-Lingual Avatars

European towns and cities have a huge wealth of historically significant and culturally important material in the form of buildings and open spaces. Virtual Environments offer the potential of recreating towns and cities for visitors to see how buildings once looked and to hear from virtual guides the history of the place. Nevertheless, one of the major challenges that still remain for widely adopting these technologies is providing natural and enjoyable ways of interaction within the virtual environment. For this, multilingualism and multimodality is required in order to enhance the learning and entertainment experience of as many users as possible.

Fig. 17. The virtual environment with the avatar guide

The goal of this showcase is to raise awareness of the potential of combining low cost technologies for creating multi-lingual guide avatars within populated urban scenes. These avatars are able to interact with the visitors of the virtual environment through natural language in order to achieve a more natural and enjoyable experience. It will provide the opportunity for visitors to experience heritage and culture of a particular town at first hand, and will increase the level of understanding by presenting the information in a way which is easily understood, reducing the language barrier to a minimum.

The environment produced in this work recreates a medieval European town from Lower Saxony (Germany) called Wolfenbüttel where most buildings date from the seventeenth century. The virtual environment developed recreates the main buildings of the town, such as the duke's palace, the library, the armoury, as well as other areas of interest. The virtual environment offers the possibility of exploring the town and interacting with a multilingual virtual guide who provides information regarding these buildings and of the town in general in a more enjoyable way.

The interaction between the visitor and the virtual environment (*Figure 17*) follows the sequence:

1. On arrival to a new location in the town, the system presents a list of questions that the visitor may wish to ask to receive more information about the current location, along with a list of questions as to which locations the visitor could go next.
2. The visitor selects a question using a typical 'point and click' operation and the virtual guide responds to the question in natural language giving more information about the location. In case the visitor has selected to move to another location, the guide continues the tour in the town.
3. When walking to another location, the virtual guide could stop several times to provide additional information related to the town and its famous inhabitants.
4. At arrival to the next location, a new set of questions is presented to the visitor and the interaction continues.

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http://people.cs.vt.edu/~jichen8/publications/IEEE-VR/VR2005-3dui-map.pdf

Heritage Networks and Portals:
European Heritage on the Web

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The Internet is for us today the easiest way to acquire information and documents, for any person in any social class. In the last few years, Romania also has known a large extent in using the computer and accessing the Internet. More and more companies offer information about their domain to public and specialists. Internet has become a huge library, opened all the time, so the on-line access is not dependent of space and time. The cultural institutions have noticed the extended potential of the Internet, and today almost all of them own a website. The museums have understood very quickly the large possibilities of the Internet and most of them have qualitative websites, with a diversified content, from popularization information to scientific articles and on-line databases. The same phenomenon is to be noticed in Romania too, where this field has advanced quickly, to recover the lost time.

I. Introduction

Computer Networks

A computer network is a group of computers (of any type) and peripheral components which share the same resources. The users' current tendency is to use computers linked in a network, not in isolation. This more and more frequent option for a network of computers and not for isolated workstations (computers) is completely justifiable by the multitude of advantages offered by this solution:
• the programs can be kept in one copy (on the server) and can be used by any user of the network;
• the databases can be exploited concurrently (used simultaneously by several users);
• hardware resources (printers in particular) can be exploited simultaneously by several users;
• Users can communicate and exchange information among them.

Types of Networks

Geographically, computer networks can be divided into the following categories:
   LAN – Local Area Networks;
   WAN – Wide Area Networks;
   PDN – Public Data Networks.

The Internet

The *Internet* is a global network (formed of over 100,000 interconnected networks) connecting over 150 million computers (their number doubles every year), and allowing communication and information transfer among them.
   The Internet resembles a 'galaxy' comprising millions of computers in every corner of the world, all of them speaking the same language (known as *Internet Protocol – IP*), all of them connected to the same infrastructure maintained by telephone companies in particular.

On the second level there are the *Internet services distributors (suppliers)* who pay the telephone companies for the right to use their telephone lines. These distributors can also make use of the satellite communication network – SIPEX (*Satellite Internet Packet Exchange*).

On the next level there are the actual users, who pay the Internet suppliers for access to the network. The Internet services distributor provides the programs necessary to connect to the Internet, technical support and the possibility of placing the user's information on the Internet.

Some of the technical terms used are:

- **Internet Node** – a computer permanently connected to the Internet and representing the location for Internet access for other computers;
- **Server Proxy** – the supplier's computer which has temporarily stored in its memory different information researched by the users so that this information need not be searched on the Internet every time;
- **Mirror Service** – a computer which doubles 1:1 the data on the main server; it is used to ease information traffic jams towards the main server;
- **Search engin**e – programs specialized in searching for information on the Internet: e.g. *Yahoo, Google, Lycos, Alta Vista, Excite, Archie*;
- **Domain** – an Internet area having a proper name;
- **Firewall** – a protection system limiting the access from the Internet into the local network of a company, thus preventing information leak.

WWW (World Wide Web)

What is the WWW and how did it appear?

The WWW appeared approximately in May 1989. Tim Berners Lee from CERN, the European Particle Physics Laboratory in Geneva, proposed a global hypertext project for the research teams of High Energy Physics Community in different geographical areas to efficiently share information. In the CERN specialists' view, the three components which this system was to comprise were:

- a substantial user interface;
- the capacity to incorporate a great variety of technologies and document types;
- the capacity to access information as a whole in spite of a large variety of computer types and the software they use, in a manner as simple as possible for the user.

How does the WWW work?

The most important characteristic of the WWW is the simplicity of the access mode to the resources. This is largely due to the implemented communication protocol called **HTTP (*Hypertext Transfer Protocol*)**. A transfer session comprises the following stages:

- a client-server connection is made;
- the client makes a request;
- the server supplies the client with the answer to his request;
- the server closes the connection.

The first stage, the connection, can be seen in the browser state bar where the message 'Connecting to HTTP server' appears. If the connection cannot be done there appears the message 'Can't connect to server', together with the reason. Once the connection to an HTTP server is established, the client makes his request which mentions the type of protocol used, the resource requested (the file or the group of files) and the way the server is to reply (the method).The protocol and the resource make

up an URL (Uniform Resource Locator). The type of protocol is the most important part of an URL, without which the browser would not know how to treat the resource requested.

We now present the existent URL protocols:

Protocol	Services
File	Besides the information accessed through the Internet, the browsers can display the content of local files; an example of URL type *file*: file://litera_discAcale/nume_fisier.extensie
ftp	If the link points to a file stored on a FTP server with public access (*anonymous FTP server*), it must be mentioned that the resource is of *ftp* type; e.g. ftp://ftp.sorosis.ro/pub/windows/www/netscape.zip
http	All documents written in HTML format are stored on a WWW server. HTTP refers to the protocol used by these servers.
Gopher	WWW browsers can also 'navigate' on Gopher servers by using this protocol definition.
mailto	It is a special type of URL allowing you to send messages through e-mail.
News	The links pointing to a newsgroup must be declared by using this protocol.
telnet	To indicate that a link requires the starting of a telnet session, the URL must be of telnet type. Most browsers cannot start a telnet session, but can in stead launch external client programs when such a link is selected.
wais	It is a protocol type (*Wide Area Information Server*) which allows searching the information in index databases starting from natural language words.

The method signifies the explicit command of the client towards the server. The most widely used method is *GET*, which means that the information is brought on the client machine.

If the request is accepted, the server produces the answer and transfers the information. (This can be seen in the browser state bar, where transfer information is progressively displayed).

Once the transfer is done, the server closes the connection and the client starts treating the data received: he loads and displays the page of received information, saves the information in a file, or launches an application called *viewer* (for example, if the information consists in a sound file, the associate *viewer* will be a **sound player**). The client will always know how to deal with a **HTML** file (***Hypertext Mark-up Language*** – the language of document description in hypertext format).

Internet Navigation Programs (Browsers)

It is very easy to explore the Internet and anyone can learn it quickly. If you are connected to the Internet supplier and you open the browser (i.e. the program for navigation on the Internet – the most popular ones being **Microsoft Internet Explorer** and **Netscape Navigator**; one of them can definitely be found on any computer connected to the Internet), the computer screen will display a web page containing text and images, and sometimes even animation. As you move the mouse, the pointer (arrow) on the display screen moves in the same direction. Sometimes, the pointer may change into a hand with the index finger up; in that particular place there is a link, i.e. a path to another web page, or, more generally, to another Internet resource. If you click with the mouse (tap the left button) when the pointer is on the link, you move to the page targeted by that link. Usually, the current page is replaced by the new page. And so,

from link to link, you can navigate on the Internet. But beginners often miss certain simple things with the help of which they could navigate much better than through successive clicks on links.

Search engines

The search on the Internet can be a long operation, often annoying for a beginner, the information volume being enormous, and the modes for storing and re-finding data very different. The search process is always difficult because of the large amount of search instruments, their different content of information and search methods, and also because of lack of standards.

The most widely searched *hypermedia* electronic documents are those containing texts and images as types of information. There are, of course, other types of documents which contain films, sounds, 3D graphics, etc. but in the field of humanities, text and image remain the main components of an electronic document. Whether they are to be used didactically or scientifically, the association between image and the written word is the most popular and most often used in this field.

The following presentation is pre-eminently destined to specialists in humanities, students and teachers who use electronic documents in the complex process of gathering information.

a. Searching for Text Information

Search engines are databases which index web pages or page titles. They send through the web '*electronic spiders' ('web robots')* to search for pages which could be added to the already existing web page database. When the robot identifies a *site* which has not yet been indexed, it adds it to its database which most frequently contains the page title, the Internet address (*URL*), complementary pages and a short fragment of the text. Although the robots work constantly, there are still billions of web pages to be reviewed; that is why searching for a new *site* will take a long time. As a result, the persons who create their own websites begin by providing information about their own pages for the search engines, which thus identify and definitely register the new address. There are several search engines you can use on the Internet, such as **Excite, Alta Vista, Hotbot, Infoseek, Lycos, WebCrawler, Google** and **Open Text Index**. Usually, the user enters keywords at the search engine site and it searches for the matching web pages.

The searching instruments are programs destined for obtaining information. The search methods may be different: *tree structure* or **directory** (see **LookSmart**), *search mechanism* (**search engine** – see **Alta Vista**), *a combination of tree structure and search mech*anism (**directory/search engine** – see **Excite, Yahoo**), and *multi-mechanism* (**multi-engine** – see **All-In-One, Metacrawler**).

a) A hierarchical search system (tree structure) uses the subject (domain) of the search. The search method is a hierarchical one and it starts with the general domain, and then follows a succession of other sub-domains. It is also called *subject search*. The site directories structure the websites as inverted trees. Each category can be divided into subcategories. For instance, **History** can be divided into subcategories such as **regional history** (history of Europe – Albania, Austria, Belgium, Bulgaria, etc., history of North America, history of Asia, etc.), **Historic ages** (Stone Age, Bronze Age, Iron Age, Roman Period, etc.), **Historical domains** (Archaeology, Anthropology, Classical Studies, Medieval Studies, Diplomacy, Heraldry, Archivistics, etc.), **Historic institutions** (museums, universities, history societies, history institutes, history laboratories, etc.), and so on. In order to move within these directories, you have to click on the links between each category and subcategory until you find what you are looking for. Or, you can use the keyword search to find certain specific sites. In most cases, those who create their own web sites register them with a site directory. Here are some examples of site directories: **LookSmart, Yahoo, The World Wide Web Virtual Library** and **The Argus Clearinghouse**.

b) A search mechanism is an instrument which can access databases by using *keywords*. It responds to different requests with a list of references. This is also called *keyword search*. It is the most popular and

the most complex search mechanism, so we shall discuss it in more detail later. Two examples of search engines: **Alta Vista,** and **Google**.

c) The third search method is a combination: *directory/search engine*. Such search instruments use both methods described above and rely on a hierarchical search system; a search mechanism can be accessed at each stage, and then, a keyword search can be done. Such search tools selectively add materials to the database and review the sites on the same subject. They can exclude the sites which contain unacceptable data, or can accept only those sites which they consider appropriate. They use a variety of criteria to evaluate the possible sites, including data quality and data quantity. An example would be **Magellan**.

d) The fourth method, *multi-mechanism* (***multi-engine*** – see **All-In-One**, **Metacrawler**, **Mamma**, etc.) refers to those search engines which analyze the content of all the other categories of search engines. These search engines are not always the most practical ones because of the very large number of displayed results.

Keyword Search

If after a keyword search, the research results for that word are on the last page of the search engine used, you should re-enter the query or use another search engine. Search engines function autonomously and you may be surprised to identify different addresses when entering the same query at different search engine sites, or to identify the same addresses when using different queries with the same search engine. Some general rules discussed in what follows may help you search the data you need on the Internet.

*1. **Enter short queries and use keywords.*** It is important to keep in mind that it is a computer, and not a person, that will analyze what you have requested to be examined/ researched. Long queries to be researched – such as "I would like to know who Homer was' – will confuse the search engine's work and will lead to unsatisfactory results. A more adequate query would be the simple introduction of the name *Homer* and possibly the domain '*Ancient history*', because otherwise you risk receiving information about *Homer detergent* or *Homer spa*.

*2. **Use logical operators to enter your query***. Operators represent rules or special instructions used in a keyword search to enter queries or requests. The keyword search starts by typing a word in the **search box** on the **home page** of the search engine. To make a request, you can use the operators suitable for the search engine where the work session takes place. While every search engine has its own operators, there are some operators common to all search instruments:

a. AND, OR, NEAR, and NOT can be used with their logical meanings to connect words and terms within a request: AND means that both words are present in the documents. NEAR supposes that the terms you enter should be within a certain number of words. OR means that at least one of the terms you specify must appear in the documents, and NOT excludes the presence of a term.

b. When you use such operators, do not forget to type them in capital letters, with no space between the operator and the terms following it.

c. The '+' and '-' signs; '+' before a term (with no blank spaces) helps to find documents containing only that term; it is similar to AND. '-' is similar to NOT and helps find documents which do not contain that term.

d. Quotation marks (' ', " ") mark words which have to be treated exactly as they are. Quotation marks are similar to operator NEAR.

e. Parentheses resemble the signs in c. with the exception that the word between parentheses is considered a unique entity.

f. The words typed in capitals are treated as proper names. Commas separate proper names.

g. An asterisk serves the function of expanding the root words. Place an * at the end of the word in order to find all the words starting with the typed letters. For example, while searching for 'history', it creates links to the web pages containing the words 'history', 'historian', 'historiography'.

h. Use the logical operator ADJ (adjacent) if you want to find documents in which one term must directly follow the other in any order.

i. Operator FAR is opposed to operator NEAR. When you use FAR, the search engine will find the documents in which the terms are at a distance of over 25 words one from the other (e.g. Lycos). FAR is frequently used together with other phrases. For instance, you can search *history FAR ancient NOT 'ancient history'* and you will find pages containing both words but not containing *ancient history*.

j. Operator BEFORE functions very similarly to AND. Here, however, the terms have to appear in the specified order, but they can be separated and within any number of words in the document.

In the table below, we present the categories of operators and their relation to the main search engines:

	Alta Vista (ii)	Excite (i)	Hotbot (iii)	Infoseek	Lycos	Magellan (iv)	Webcrawler	Yahoo
+	x	x	x	x	x	x	x	x
-	x	x	x	x	x	x	x	x
AND	x	x	x		x	x	x	x
AND NOT	x	x				x		
NOT			x		x		x	
OR	x	x	x		x	x	x	x
ADJ					x			
BEFORE					x			
FAR					x			
NEAR	x				x			
( )	x	x	x			x	x	
*	x		x					x
" "	x		x	x	x		x	x
Language	x		x		x			
Range of dates	x		x					x

Legend:

a. Logical operators must be typed in capital letters, otherwise they will not work.

b. + and – cannot be used for advanced research.

c. Research with **Hotbot** search engine may be very sensitive if at least one of the letters of the query is a capital one. If all the letters of the query are small, Hotbot will ignore the display of the necessary results. So, the search for 'windows' will display the pages containing '*windows'*, '*Windows'*, and '*WINDOWS'*, while '*Windows'* will only trigger the display of pages containing '*Windows'* but not '*WINDOWS*'. Besides this, for the logical operators to work in **Hotbot**, you have to select '**Boolean phrase**' from the '**All the words**' menu.

b. Searching for Image Information

Most keyword search engines (**Lycos, Excite, Google, Mamma, Metacrawler, Yahoo**, etc.) offer the possibility of specifying the type of document wanted: text, sound, image, video, etc., by selecting at the beginning of the search process the **'images'** command, usually under the form of a radio button.

When you have introduced the keyword and activated the image selection button, the search engine will display a list of images organized in a table on one or several successive pages, the selection being done on the following criteria:

- language of the typed word
- image name
- image size
- image source

Some search engines also provide a link towards the original page, and in some cases a series of other images from the keyword searched domain are also displayed.

If you use a multi-mechanism search engine (***multi-engine***, see **All-In-One, Metacrawler**, **Mamma**, etc.), additional technical information is also supplied:

- number of pixels
- file extension: .gif, .bmp, .jpg, etc.
- size (in bites) of the image file

The images found by the search engine are displayed as pictograms which eases rapid visualisation of the list so that the user can identify the images requested. The selection is done by the person who does the research; after activating the pictogram with a click and visualising it full size, the user can store the image either by saving it (right button click on the image and selection of contextual menu ***Save Picture As***…, indicating the place of storage – ***My Pictures***), or by copying it directly into another type of document such as Word, Excel, Access, etc. (right button click on the image and selection of contextual menu ***Copy***, the transfer (sticking) being done with the ***Paste*** command).

Video sequences or films can be seen online but very few of them can be copied. However, if this is possible, there exists a special transfer facility (***Download***) with specification of the exact name and location for storage on your own computer. Watching a video film online is possible by means of some special programs (***Players***): **Windows Media Player, QuickTime Player, BSPlayer, RealOne Player**, etc.).

c. Searching for Sound Information

There are several types of sound files accessible on the Internet: most of them are simple background tunes of **midi** or **wav** type. They are not documents and cannot be considered information because they do not have a scientific value. A special category is represented by the compressed files type **mp3** usually containing music. **Mp3** standard imposed even in the case of sound documents of scientific value (political, cultural, civic, etc. radio recordings for such older documents); today, however, they accompany video films. Most search engines provide, through a radio button, the possibility of selecting sound documents, the mode of selection and display being identical with the one used with images and video films. As in the case of video documents, sound files are accessible online (the same ***players*** can be used) or may be transferred through a ***download*** program.

It is important to remember that, similarly to the information taken from classic documents, the user must abide by copyright laws, i.e. all information is quoted with scientific notes, and in the references section he will mention under ***webography*** the addresses of the web pages from which he has retrieved the data (text or images).

II. Special Internet Services[1]

a. News Channels

Net news is one of the most popular applications of the computer nets, enabling information flow and communication by sending and receiving messages concerning certain areas of interest that have as correspondent specific newsgroups. The traditional news net is called USENET and it is different from the Internet (some Internet sites do not receive news, while other sites may receive news without actually being included in the Internet).

A newsgroup creates a frame for discussions on well established themes. To such a group may subscribe everybody who is interested in the subject. The members of a newsgroup may use a special type of program (such as 'user agent') which enables the reading of all articles/messages transmitted in a newsgroup. This program is called 'news reader' and it also sends the messages in a newsgroup: each article sent to a newsgroup will automatically be sent to all the members of the group, irrelevant of their geographic location.

The transmission of the news messages varies in time from a few seconds to several hours, depending on the location on the net of the transmitter and the receiver. Although the newsgroups have a different implementation, they may be said to have the same use as that of the e-mail lists.

Alternative implementations have appeared recently, having the same objectives: to enable information flow and communication. These refer to special software that implement discussion lists, and to the sending of news in the form of e-mail messages through certain service suppliers which allow subscription to different areas of interest on special sites.

Examples:
• National Geographic – History http://www.nationalgeographic.com/siteindex/history.html
• History News Network http://hnn.us/
• History News Service http://www.h-net.org/~hns/
• Center for History and New Media http://chnm.gmu.edu/index1.html
• History News http://www.asme.org/history/newslett.html
• Art History News http://www.usc.edu/
• Center for American History News http://www.cah.utexas.edu/
• History Links http://historylinks.freeservers.com/
• History in the News http://history.uchicago.edu/

b. Discussion Forums

Discussion Forum is an online discussion platform meant to encourage and manage, over a period of time, online text among members of special interest groups or project teams.

Sometimes called newsgroups, the forums are discussion groups on the Internet, where more persons may send messages (publicly) or may exchange opinions on different subjects. The discussions do not take place in real time, as in the case of chat or Instant Messaging, but more people can be involved in a discussion.

The Discussion Forum offers specialists, students and others the opportunity to contact and inform each other in writing, on various themes concerning history, archaeology, art, sciences, etc. within the frame provided by online services.

Users may create a count and a password and may choose the theme of discussion (usually presented by the page webmaster on areas of interest), after which they may send a written text to the Forum, just like in an e-mail box.

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[1] Our examples are for historians.

The Discussion Forum is based on a newsgroup selector which allows the user to choose a theme from the list. In most cases museums use a simple discussion forum, presenting the information in a scroll list on three main fields:
• The title of the message
• Technical data: e-mail address and the date of the dispatch
• The countering of the number of readers and (eventually) the number of answers.

The actual reading of the text is done by activating the title of the message, in a new window which also provides complete data on the author.

Examples:
• History Teachers Discussion Forum http://www.schoolhistory.co.uk/forum/
• Talking History http://pub55.ezboard.com/btalkinghistory
• SF Fandom Ancient History http://pub55.ezboard.com/btalkinghistory
• Axis History Forum http://forum.axishistory.com/
• Britannia History http://www.britannia.com
• Able2Know History Forum http://www.able2know.com/forums/viewforum.php?f=46
• Digger History Forum http://amazingforums.com/forum2/DIGGERHI/forum.html
• Scottish, Celtic History Forum http://skyelander.proboards17.com/
• History Today http://www.historytoday.com
• Oral History http://oral-history.ncf.ca/
• Virtual Teacher Center History http://schools.becta.org.uk/
• Military History Video http://www.militaryhistoryvideo.com/
• Women in World History http://chnm.gmu.edu/
• Military History Forum Frigate http://jollyroger.com/zz/ymilitaryd/MILITARYHISTORYhall/shakespeare1.html
• Ukulele History http://www.nalu-music.com/
• HistoryChannel.com Veterans Forum http://veterans.historychannel.com/default.asp

c. Portals and Directories

The Portal is a site that offers a wide range of services: e-mail, forum, search engine, web hosting etc. A portal or directory, is a mega-site with thousands of indexed links meant to facilitate the visitor navigation or to help him find whatever she/he is looking for. Thus a portal registers indexes and classifies on specific areas for the presented sites.

Any Internet visitor searches for a certain subject with the help of the search engines, using a key-word or, easier, in portals or directories. The largest directory on the Internet is Yahoo[2] (it is not a search engine), which is actually a huge portal, in which registered sites are listed in categories, subcategories, etc.

For a webmaster, the registering of a site in a portal is a more reliable source of visitors, especially if the site is not well adapted to the search engines. Registration in a portal is a fundamental condition for the rapid growth of traffic on the site. There are sites that have dozens of visitors from the search engines, and hundreds, even thousands from directories (portals).

For the Internet navigators, the visiting of a portal is very useful, for knowing the most popular sites from the area she/he is interested in. Furthermore, the navigators may use the search engines in order to find whatever they search.

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[2] www.yahoo.com

Examples:
- Specialist Portals and web Resources – Bodleian Library Oxford University http://www.bodley.ox.ac.uk/dept/readerserv/history/portals.htm
- Canadian History Portals http://www.accesswave.ca/~hgunn/special/inservices/lockview/cdnhist.html
- University of Canterbury's Library Homepage http://library.canterbury.ac.nz/
- Cleveland State University's Library Homepage http://www.ulib.csuohio.edu/portals/his-m.shtml
- HyperHistory http://www.hyperhistory.com/
- The History Journals Guide http://www.history-journals.de/
- History Matters http://historymatters.gmu.edu/
- Paperazzi.de http://www.paperazzi.de/
- History TV http://mitglied.lycos.de/TicoFluck/home.html
- HistoryWorld http://www.historyworld.net/default.asp
- Geschi.de http://www.geschi.de/
- Nachrichtendienst fur Historiker http://www.nfhdata.de/premium/index.shtml
- American History http://us.history.wisc.edu/hist102/guide/guide.html
- H-Net http://www.h-net.msu.edu/
- Digital History http://www.digitalhistory.uh.edu/historyonline/lesson_pl.cfm?
- The Encyclopaedia of World History http://www.bartleby.com/67/
- HistoryChannel.com http://www.historychannel.com
- History Television http://www.historytelevision.ca/
- History Travel http://www.aetntravel.com/tours/tours.asp?type=12
- History Buff http://www.historybuff.com

Some notions about the institutions that sponsor cultural patrimony:

International institutions

These are generally foundations or non-profit institutions which promote culture and education world wide, by using all methods, and which protect the right to culture.

Examples:
- The Heritage Foundation, http://www.heritage.org
- World Heritage Site, http://www.worldheritagesite.org
- World Heritage Committee, http://whc.unesco.org/
- ICOMOS, http://www.international.icomos.org
- NICC – New International Cultural Centre, http://www.nicc.be/nicc.php

European public institutions

Just like the international institutions, these are foundations or non-profit institutes which promote culture and education in Europe.

Examples:
- European Heritage Network, http://www.european-heritage.net/sdx/herein/index.xsp
- CALIMERA, http://www.calimera.org/default.aspx

European national institutions

These are foundations or non-profit institutes which promote culture and education in the native countries.

Examples:

Government affiliated
- Canadian Heritage, http://www.canadianheritage.gc.ca
- IPPAR – Instituto Português do Património Arquitectónico, http://www.ippar.pt/english/index.html
- Heritage of Ireland, http://www.heritageireland.ie/
- Austrian Digital Heritage Initiative, http://www.digital-heritage.at/index_e.html
- CultuurNet Vlaanderen, http://www.cultuurnet.be/front/index.jsp
- Deutschen Nationalkomitees für Denkmalschutz, http://www.nationalkomitee.de/
- Kulturális Örökségvédelmi Hivatal – National Office of Cultural Heritage, http://www.koh.hu/index.php
- Netherlands Department for Conservation, http://www.monumentenzorg.nl/index.html
- Riksantikvarieämbetet – Cultural environment, http://www.raa.se/
- CIMEC – Institutul de Memorie Culturală, http://www.cimec.ro/

Public
- ArtQuest, http://www.artquest.org.uk
- HEIRNET – Historic Environment Information Resources Network, http://www.britarch.ac.uk/
- Iran Heritage Foundation, http://www.iranheritage.com/default.htm
- BEK – Bergen Center for Electronic Arts, http://www.bek.no/
- ICCROM – International Centre for the Study of the Preservation and Restoration of Cultural Property, http://www.iccrom.org/
- Kultura Latvija, http://www.culture.lv/
- Culturenet Sweden, http://www.kultur.nu/
- OCIM – Office de Coopération and Information Muséographiques, http://www.ocim.fr/
- ProHelvetia, http://www.pro-helvetia.ch/
- Russian Cultural Heritage Network, http://www.rchn.org.ru/defengl.htm
- The Arts Council / An Chomhairle Ealaíon, http://www.artscouncil.ie/
- The Russian Culture Web Portal, http://www.culture.mincult.ru/
- FranceWay, http://www.franceway.com/culture/culture.htm
- Brussels-Capital Region, http://www.bruxelles.irisnet.be/home.html

Ministries
- Ministry of Culture and Tourism, http://www.kultur.gov.tr/, Turkey
- Ministeri de Presidencia i Turisme, Andorra, http://www.andorra.ad/ca-ES/Pagines/default.aspx
- Ministério da Cultura, http://www.min-cultura.pt/index.html, Portugal
- BM:BWK, Bundesministerium für Bildung, Wissenschaft und Kultur das Zukunftsministerium, http://www.bmwf.gv.at, Austria
- Bundesamt für Kultur, http://www.kultur-schweiz.admin.ch/, Switzerland
- Ministry of Culture, http://www.culture.in.mk/, Macedonia
- Ministry of Culture of the Republic of Estonia, http://www.kul.ee/index.php?lang=en, Estonia
- English Heritage, http://www.english-heritage.org.uk/default.asp, United Kingdom
- Hellenic Culture, http://www.culture.gr/, Greece
- Kulturministeriet, http://www.kum.dk/default.asp, Denmark
- Kulturdepartementet, http://www.regeringen.se/sb/d/8339 (English: http://www.sweden.gov.se/sb/d/8371), Sweden
- Lietuvos Kultūros Ministerija, http://www.lrkm.lt/, Lithuania
- Le Ministère de la Culture et de la Communication, http://www.culture.gouv.fr, France
- Ministarstvo Kulture Republika Hrtvaska, http://www.min-kulture.hr/, Croatia
- Ministère de la Culture, de l'Enseignement Supérieur et de la Recherche, http://www.mcesr.public.lu/, Luxembourg
- Ministerie van Onderwijs, Cultuur en Wetenschap, http://www.minocw.nl/, The Netherlands

- Ministerio de Cultura, http://www.cultura.mecd.es/, Spain
- Ministerstvo Kultury, http://www.mkcr.cz/, Czech Republik
- Ministrstvo za Kulturo, http://www.kultura.gov.si/, Slovenia
- Nemzeti Kulturális Örökség Minisztériuma, http://www.okm.gov.hu/, HUNGARY
- The Ministry of Culture and Church Affairs, http://www.regjeringen.no/en/dep/kkd.html?id=545, Norway
- Ministry of Education Finland, http://www.minedu.fi/minedu/index.html, Finland
- The Ministry of Education, Science and Culture, http://eng.menntamalaraduneyti.is, Island
- Pontifical Council for Culture, http://www.vatican.va/roman_curia/pontifical_councils/cultr/index.htm, Vatican
- Ministry of Education, http://www.education.gov.mt/default.asp, Malta
- Kulturarvsstyrelsen, http://www.kuas.dk/index.jsp, Denmark
- Ministry of Culture, http://www.mc.government.bg/, Bulgaria
- Ministry of Culture, http://www.mincultrf.ru/, Russia
- Ministry of Culture and Religious Affairs, http://www.cultura.ro, Romania

Museums Portals
- Tento.be, http://www.museumsite.be/
- Canadian Museum of Civilization Corporation, http://www.civilization.ca/

III. Museum web pages. Virtual Museums

Museums play an important role in education. They make it possible for learners of every age to see artefacts from various domains of human life and allow them to develop and consolidate the knowledge acquired in the traditional education system, but also to discover their own routes of interest among various cultural entities. A classic museum is an organised collection of cultural objects (joined in thematic exhibitions) and has a certain location. A web-based museum is a similar one, with the exception that electronic objects shall not appear in a granite and marble collection, but in a certain number of web pages. There are some interchangeable analogous terms in the specialist literature on electronic museums: *virtual museums, e-museums, virtual galleries, on-line museums* or *on-line galleries*.

The virtual museum is an easy, modern way to complete a real museum with a collection of any nature. The function of a virtual museum is that of organizing all types of exhibitions and of participating in people's education through exhibitions, guidance, practical lessons, educational courses, conferences, guides, catalogues, etc.

The virtual museum is destined to popularize collections and it is not meant to replace a real museum. This is why Bernard Deloche (Deloche 2001), a professor of art philosophy at the University in Lyon, France, and member of The International Council of Museums[3] (ICOM), is against the virtual museums that do not have their own collections. The virtual museum must, through interaction and specific, technical methods (image, film sound), bring visitors to the real museum and not estrange them. This is why, in most cases the virtual museum is designed in such a way as to stir the interest for the real collections with the help of images or photos of the items in the collections, 3D models, movies, panoramic images (at 360º), theme panels (slides), electronic guides and games (of the type 'find out for yourself'). Such a museum does not provide the whole catalogue of exhibitions, but only fragments of it, representative images, general descriptions or documentaries. The visitor of a website dedicated to a museum is offered a free virtual tour of the collections, meant to stimulate his taste for culture, to stir his interest and to encourage him to actually visit the museum. The economic element must not be ignored in this context, since many of the museums that have prestigious collections finance themselves

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[3] International Council of Museums, http://icom.museum/

by selling tickets. There is the technical possibility of creating a complete virtual museum that would include, in hypermedia format, the entire collection. This museum would provide, for an on-line fee, a password and an account that would allow the visitor to go through a complex virtual tour. However, this idea is not very popular, and there is no prestigious museum that would abandon the actual, classic exhibitions for virtual ones.

A virtual museum is conceived according to all the rules of the classic layout. It can represent only the category of museums to which it belongs (site museums, local museums – rural or urban, regional museums, national or international museums), or the field to which it is dedicated: history, archaeology, art, ethnography, sciences etc.

a. The general principles of display in a virtual museum

The exhibition is the main form of cultural and educational manifestation of a museum. Through it, the museum spreads the information concerning the items that make up its patrimony. The theme of the exhibition represents the theoretical and practical layout of objects and images according to a scheme that is adequate to the purpose of communication (Nicolescu 1979:158–180; Florescu 1998:170–174).

Although the virtual museum does not raise such organizational problems as space, light, access, timetable etc., it must respect the same rules concerning the theme of the exhibition, the display, the navigation accessibility and the dynamic of display.

The idea of systemizing objects according to a theme appeared in the 19th century, especially in the museums of history. Today we have a wide range of museums – of history, archaeology, art, ethnography, sciences, etc, many of them grouping two or more themes within the same museum. Each of these themes can be approached through different ways of display:

1. basic, permanent exhibition
   a. theme exhibition
   b. collection exhibition
2. temporary theme exhibition
3. circuit exhibition
4. exhibition of photos or panels

1. *The permanent theme exhibition* must be representative for the profile of the museum. The thematic exhibition is characterized by the fact that its purpose is to present a fragment of specific reality (archaeological, ethnographic, artistic and historical, etc.) remodelled, according to the updated scientific information, in a suggestive, emotional and educational form.

Such an exhibition should include a selection of the exhibits from the museum that should be representative both for the area of spreading and for the subject they represent.

Example:
• Muzeul Național de Istorie a Transilvaniei, http://www.museum.utcluj.ro (*Fig. 1.*)

2. *The permanent collection exhibition* does not necessarily need to represent the profile of the museum. The selection of the pieces is done according to only one criterion, which is value. This type of exhibition is meant to popularize a valuable fund, which, due to its nature, is only partially represented in the permanent theme exhibition.

Example:
• The Metropolitan Museum of Art, http://www.metmuseum.org/Works_of_Art/collection.asp?HomePageLink=permanentcollection_l (*Fig. 2–3.*)

3. *The temporary thematic exhibition* is smaller in size than the permanent theme exhibition, and the theme has certain temporal and scientific boundaries. The temporary exhibition may use certain auxiliary and complementary exhibits and more complex technical methods (such as 3D reconstructions, musical background, animation, etc.).

Example:
• Muzeul Național de Istorie a României, http://www.mnir.ro/temp/stefan/inceput.htm (*Fig. 4*)

Displaying the items in a virtual museum raises problems of a different nature: the item, the artefact, the painting, etc, are presented to the visitor through the stop of the camera, the lenses of the cine-camera or through the computer done 3D reconstruction. The indirect access to the exhibit reduces the beauty and the feeling of the emotional contact. The role of the photographer, the video operator or the computer

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

programmer is decisive in the making of the display. It is generally accustomed to exclude the artistic photos, which would express more the artistic sense of the photographer and less that of the visitor.

The digital photo, done in a cool, technical manner, may underline many of the details of the exhibit, in an attempt to stir the interest for a direct contact with it. A single, good shot, taken from a correct angle and of the right size is sufficient to illustrate the particular exhibit. Natural light or alternative sources of light are used in such a way as to avoid the impression of shadow, change of colour or reflection. In some cases we may find detail photos if the exhibit is special and a certain detail needs to be emphasized.

Examples:
• Eternal Egypt, http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.display.about&language_id=1&link_key=4

The digital film may present even more faithfully an item from an exhibition, but it is generally used for panoramic, general shots, since it has the disadvantage of taking up a lot of the host server's memory – which implies a diminished image quality. The same problem occurs with the transfer rate of the dynamic images, affecting the image quality, fracturing it or interrupting it very often. The lack of a player program for visualizing the video images or the clash between the programs used by the webmaster and the visitor may lead to the impossibility of visualizing the film sequences. Solving these problems is one of the webmaster's tasks. He has the duty to provide the visitor the option to download the player software.

Examples:
• Eternal Egypt, http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.display.about&language_id=1&link_key=4

• Florida Holocaust Museum, http://holocaustmuseum.org/tour_high2.cfm, (software Real Player)

The 3D graphic reconstructions are meant to remodel the damaged items, the fragmentary pieces or the large ones, and the special exhibits that may present certain technical or artistic features that can be emphasized through 3D graphics. There are several ways of making a three-dimension object: photogrammetry or photographic survey, 3D laser scanning or drawing in CAD (Computer Aided Design) system. There are also several ways of exposing and visualizing the three-dimension objects: as interactive movies or in VRML (Virtual Reality Modelling Language) – which offers the possibility of immersion, of audio, visual and tactile contact with the exhibit.
Examples:
• Eternal Egypt, http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.display.views&language_id=1 (software Macromedia Shockwave Player)
• The Virtual Biochemistry Laboratory, http://nobelprize.org/educational_games/chemistry/plastics/index.html (software Macromedia Shockwave Player)
• Russian Museum Virtual World, http://www.rusmuseum.ru/eng/museum/net/vwrm/ (software Blaxxun Contact)
• Van Gogh Museum, http://www.vangoghmuseum.nl/cgi-bin/virtual-tour/login.asp (special software Vangogh)
• LeMO – Lebendiges virtuelles Museum Online, http://www.dhm.de/lemo/home.html, (software Blaxxun Contact)
• The Lost Museum, http://www.lostmuseum.cuny.edu/ (software Macromedia Shockwave Player)
• Toshiba Virtual Science Museum, http://museum.toshiba.co.jp/index_3.html, (software Macromedia Flash Player)
• Deutsches Museum, http://www.deutsches-museum.de/, (software QuikTime VR) (*Fig. 5*)

4. *The circuit and the panel exhibitions* are less used in a virtual museum. Due to the complexity of the making of a web page for a virtual museum and the administrative problems, circuit exhibitions are popularized only through posters, notices or general information and photographs. The copyright does not allow the full exposure of the exhibition on the Internet or the marketing of photos of the exhibits included in the collection, which would strongly reduce the number of visitors. The panel exhibitions have the inconvenience that they work with photos, and a photo taken after another one is poorer in quality. Most of the times the entire panel is photographed with the purpose of presenting the exhibition on a general, informational level.

Examples:
• Olympic Museum, http://www.olympic.org/uk/passion/museum/virtual/index_uk.asp,
• Israel Bible Museum, http://www.israelbiblemuseum.com/,

Fig. 5.

- John D. Calandra Italian American Institute Museum, http://qcpages.qc.edu/calandra/museum/index. html,
- Oriental Institute Museum, http://oi.uchicago.edu/oi/mus/qtvr96/qtvr96_tours.html,
- The Kelsey Museum of Archaeology, http://www.lsa.umich.edu/kelsey/galleries/Exhibits/Big_Textile/ Big_Textile/previous_textile_exhibits/previous_textile_exhibits.html,
- Chewelah Museum, http://www.chewelahmuseum.org/,

5. *The site exhibition*. There are two categories of web pages dedicated to a site (archaeological, historical, architectural, paleo-anthropological, etc.): popularization web pages and scientific ones. The sponsoring institution[4] is not always a museum since there is no obligation to present one's own collection. The sites presented are large complexes (of regional, national or international interest) that belong to a country's heritage and which can be researched, administered and published by a ministry, a national academic institute, an university, a foundation etc. In most cases the site exhibitions include images, movies and information related to the actual site and collections of objects (artefacts and ecofacts) discovered in the site or belonging to it.

Examples:
- La Grotte de Lascaux, http://www.culture.gouv.fr/culture/arcnat/lascaux/fr/
- Carnuntum, http://www.carnuntum.co.at/
- Delphi, http://www.ancient-greece.org/archaeology/delphi-archaeology.html
- L'Archeosite d'Aubechies, http://www.archeosite.be/
- Les fouilles archéologiques, http://www.culture.gouv.fr/culture/arcnat/charavines/fr/fouille.htm
- Pueblo Grande Museum and Archaeological Park, http://phoenix.gov/PARKS/pueblo.html
- Le parc archéologique européen de Bliesbruck Reinheim, Moselle, France, http://www.archeo57.com/ frontSite?controller=ViewSection&lang=fr&id=bliesbruck
- Soprintendenza archeologica di Pompei – Official site, http://www.pompeiisites.org/

b. Creating an electronic museum (Schweibenz 2004; MacDonald & Alsford 2004)

The construction of a virtual museum supposes an algorithm such as the following:
➢ Before actually starting to build an e-museum, the development team must clearly define the specialty, purpose and contents of the new museum. They will then have to search on the Internet and see the current state of affairs of other similar attempts so that they may draw an analysis of the technical solutions used and the facilities offered by them;
➢ Constructing and indexing a multimedia object database which could include a wide variety of entities such as:
  - Scanned documents (promotional printings, special patents, the first stock exchange certificate, etc.);
  - Images of the various cultural objects, from paintings and art photographs to architectonic ensembles or exhibition ensembles;
  - Audio recordings (outstanding speeches, special musical pieces and so on);
  - Video recordings (speeches, technical presentations, scientific experiments, various prize awarding ceremonies, exceptional television advertisements, etc.);
  - Virtual reality elements (for instance, architectural models of famous buildings, conceptual models from certain research fields).
➢ Adding advanced facilities for users, which should be available on the web interface, or concerning the quality and performance of the access to the digital objects contained:

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[4] Here we refer to the official web pages and not to ones made by amateurs, private collectors or institutions.

- Providing a 'preview' possibility for each object either as descriptive text, or as 'thumbnail' image (small size image);
- Specifying the size of the file to be downloaded;
- Offering the possibility to access the full size picture of the electronic object as well as the small size one. For a cultural object, a master digital equivalent can be generated and then derived in various versions according to the place where it will be used. For example, an image can be digitized with a low, medium or high resolution according to its usage – on the web, for image editing or printing;
- Drawing a map of 'thumbnail' images connected (through specific links) to their full-size correspondent, which could be downloaded if necessary;
- Superposing a rectangular grid over every image which would allow to zoom on every rectangular fragment of the grid, or to personalize the visits according to the wishes of users who must have the freedom to choose their own way around the museum depending on their individual needs. Moreover, as opposed to the traditional museum, users will benefit from permanently available guiding and from the fact that there are no restrictive compartments, permanent arrangement of exhibitions, and spatial restrictions. (It all depends on the manner of organizing the electronic collection).
➢ Personalizing the visits can be done by performing the following operations:
- Displaying as virtual gallery the subset of cultural objects interesting for a certain visitor, the objects being linked among them by specific keywords and by other specific hypermedia elements;
- Placing the exhibitions in order so as to highlight trends and routes of interest;
- Generating individualized maps and menus to highlight the visitors interested in instruction and education;
- Indexing the contents of the museum, at least alphabetically, with the names of the cultural entities (accompanied by images);
- Developing a menu system which would contribute to the selection of the collection categories of interest (time, artistic trend, artist, object content, etc.).
➢ Building a virtual reality interface that would immerse the visitors into the museum's digital world so as to increase their satisfaction;
➢ Permanently gathering the e-museum visitors' reaction and expanding the interface system with specific elements for on-line instruction and education.

We can draw the conclusion that in order to become integrated into the new and evolving Informational Society, the virtual museum must enter a cycle – conservation, access (open), on-line instruction and education, creative effort stimulation, as you can see in *Fig. 6*.

A group of scientists from the National Computer Research and Development Institute, Bucharest[5] and the University of Polytechnics, Bucharest[6], elaborated within the project **Applied Web Technologies: Virtual Museums in Romania** (Ciocoiu, Cosoiu & Diculescu 2002), from a technical point of view, a model to create web pages, that make up a virtual museum. The model was organized as a hierarchical structure, based on a pattern, general enough to cover all the different needs of the different museum sites. The web pages, designed to work with any set of data, which respects the format pattern, and to correspond with the structure of the database, are connected by a central site of the portal type, which will be optimized, in order to easily find the required information.

This type of virtual museum includes:
➢ graphic elements, image folders with the .jpg or .gif extension, optimized, within the folder's size, for a quicker load; the processing is done by using Adobe PhotoShop 6.0 and Ulead GIF Animator;
➢ descriptive elements of images (explanations), text folders;

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[5] www.ici.ro
[6] www.pub.ro
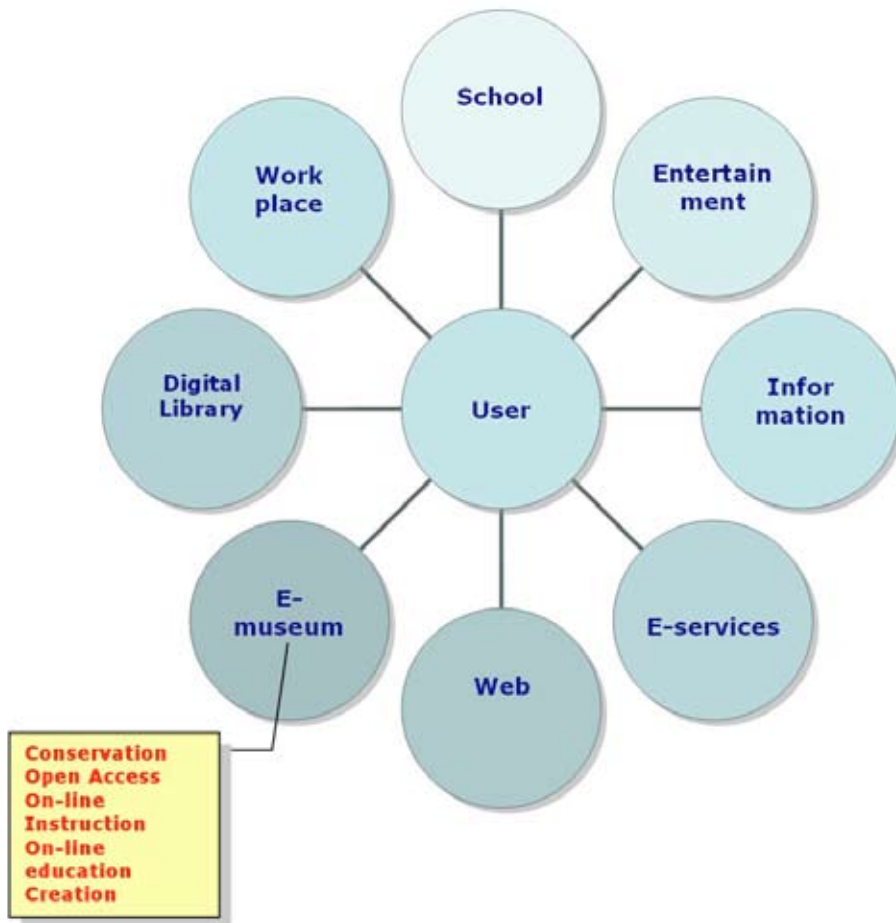
Fig. 6. E-museum in the Informational Society (Vlădoiu & Negoiță 2003)

➢ utility programs for administration, loading, data validation and conversion, written in a language of general use, like **Inprise Delphi**. These allow the loading of the hierarchical structure of the pages that make up the site of any museum.

➢ the **MySQL** database, called Museums, which includes the necessary information grids;

➢ additional folders, such as configuration text folders and site images;

➢ the actual web pages, with the **.php** extension, which make up the site's logic: the pages are generated dynamically, with the PHP (Personal Hypertext Processor) interpreter; the sessions of users are used to keep and restore the settings; **PHPEd** is used as an editor, as it provides a coloured syntax and remembers the variables and the definite functions.

From all the elements mentioned above, unchanged remain the web pages designed from the beginning to work with any data which respect the format pattern, the structure of the database and the utility programs.

The site of any museum has a **logical hierarchical structure**, which requires the creation of differentiated databases, which will allow the automatic generation of the pages and of the links between them. Besides the actual consulting functions, offered by any such web project, notices and promotions are planned on certain occasions such as national holidays or local events. These notices, by being placed on the Internet, can be easily seen by the users. The project involves a team of programmers and teams charged with the data gathering and project management.

The navigation system. It is done logically and hierarchically, according to the museum's activity area(s) the museum's Home Page must present hyperlinks to all the sections, cultural / scientific and

technical / administrative. The information will be distributed ergonomically within the page. It will combine text and image (or sound and film). The size of the page must not force the visitor to continually use the scrollbar in order to navigate on the vertical. The similar pages that continue the information are preferably numbered and connected by hyperlinks for a linear, navigation on the horizontal. If, by some reason, the fractioning of the information is not wanted, the *top – down* buttons are used within the same page.

c. The structure of a museum web page

*i. The section of data and cultural/scientific information***:**
➢ the history of the museum or the collections;
➢ the description of the museum;
➢ the actual exhibition, organized hierarchically on domains and sub domains (virtual tour);
➢ data on the authors and their scientific;
➢ scientific research projects;
➢ library services, archive consulting, etc;
➢ e-magazine;
➢ virtual library, scientific and popularization works edited by the museum;
➢ planning of conferences, sessions, symposiums, scientific congresses, round tables, book presentations, and other scientific or culturally promoting events;
➢ Didactic-educational projects and projects for cultural recreation (improvement courses, thoroughgoing courses, lessons of history, art, sciences for students, didactic games, etc).

ii .Technical-administrative section:
➢ web page updating;
➢ cultural, technical and administrative news;
➢ internal search engine;
➢ contact with the webmaster and the scientific authors;
➢ feedback form for suggestions, complaints and commentaries from the visitors;
➢ copyright data;
➢ Website map.

Examples of European and Romanian museums (see **Appendix** 5).

d. The design of a museum webpage

In the conception phase of design, the main objective is to create an attractive look in order to offer the visitor of the site a feeling of satisfaction, as she/he goes through the pages of the site. The design of a site must ensure, among others, an optimum relation between the performances of the browser and the aesthetics and functionality of the site. The practical decisions, which will lead to the accomplishment of the established objectives, will be taken in this phase of design. Some of these objectives concern the number of images or graphic elements included in the page, the amount of text, what texts or images will be used as links.

In order to take the right decisions concerning the design of a site, some basic principles must be obeyed:

➢ **The association of meaning**. The power of the hypertext is used to establish links between information related in meaning.

➢ **Maintaining competitiveness**. Since the *Web* is a very competitive environment, the site's design must be maintained at the lowest 'cost' possible, from a visitor's point of view. This cost includes the time necessary for the loading of pages, the supplementary applications, needed for an optimum visualization of pages and the visitor's effort to understand the presented information.

➢ **The efficient use of resources**. There is a selection of those elements needed by the user, and which are the most efficient from the point of view of the folder's size, of the access time, and of the further maintenance.

➢ **Concentrating on the user's needs**. This is probably the most important principle of web design, and paradoxically it is most often ignored. An efficient web site is not built to satisfy the designer's taste (or that of the person who ordered the site). It is also not built to show off the vast knowledge of the latest web programming techniques. Its purpose is to satisfy the visitor's needs. Focusing on the visitor is the main priority of a quality site.

➢ **Understanding permeability**. This principle refers to understanding and acknowledging the fact that the visitor may access a site through any page, usually with the help of the links provided by the search engines. This is why the information within a page is preferred to be self-supportive, without essentially depending on the information presented in the rest of the site. If this is not possible, the presence of efficient navigating instruments is mandatory. These instruments should help the user visit the site.

➢ **Creating a pleasant, fluent and coherent look**. The pages of the site must offer the impression of a well organized whole. The visual elements – the icons, the navigation instruments – must be coherent throughout the site, each page must present clear clues regarding its purpose, its identity and the identity of the site as a whole.

➢ **Sustaining interaction**. Even if you do not use forms that may enable a high level of interaction with the visitors of the site, the presence of information concerning the possibilities of contact – at least the webmaster's e-mail – is mandatory. This way the users may acquire further information or may report eventual problems they had while visiting the site.

➢ **Sustaining navigation**. Ensuring efficient navigating instruments is one of the basic conditions of a quality site. The *Web* folklore states that a good site is that in which the user should never be forced to use the *Back* button of the browser.

IV. Types of Hypermedia Documents / Specific Programs

According to its nature, information can be:

➢ Numerical, alphabetical or alphanumerical (numerical and /or alphabetical) data, processed through specific operations.

➢ Documents containing words organized in sentences, paragraphs, pages edited by special programs – document editors – with typing, page setup, spelling and syntactic facilities. Most of the document editors allow the insertion (and even the processing through specialized programs) of non-text objects such as tables, images, drawings, graphic representations. Modern printers may accurately reproduce graphic images but there are also devices specialized in printing graphic images (plotters).

➢ Audio sequences generated by the human voice, real phenomena, musical instruments or electronic synthesizers. The Windows systems, for example, have utilities for the processing of audio information.

➢ Video sequences of the types: movies or animated images, may be administrated by video cameras or 2D or 3D graphic programs. The images may be accompanied by audio sequences.

The automatic systems that integrate the processing of general information with that of sound and images are called *multimedia* systems. If these are administrated in a net they are called *hypermedia* documents.

The notion of hypermedia suggests the combining of several environments. The environments that present interest are those that occur in well established time intervals, eventually in interaction with the user such as audio and video environments (sounds and movies). The processing of hypermedia information is a quite recent ace of the information technologies. These have extended from the area of a local computer integrated within a system of bureaus to computer nets.

Thus, the internet communication services have evolved in time from text messages (electronic messages, talk, text chat) to the use of more complex techniques with multimedia features: e-mail in which one may insert images, documents, films or any types of objects, audio conferences, video conferences, audio discussions.

The hypermedia facilities available in computer nets have recently become very attractive to many users. In this context, there is a current preoccupation to develop the techniques used for an advanced integration within the services provided by the computer nets.

a. Text documents

The text based information is integrated, in one way or another, in almost any application. Thus, besides the text folders of the type ASCII, the text appears, with certain specific formatting, in folders created by a text / document editor, in Excel documents or even as comments for the more general multimedia objects. Together with the development and the spreading of the new Graphical User Interfaces, the fonts become more and more complex, allowing for special effects of colour, shadow, shape etc. From all the data types mentioned above, it is the text which requires the smallest memory space.

Example:
• Smithsonian HistoryWired, http://historywired.si.edu/index.html (software SMARTMONEY MAPS Technology)

b. Sound documents

Sound waves will be converted in numeric (digital) form by a specific analogue numeric converter. The transformation process may induce errors ('noises'), but these are generally minor, undetected by the human ear. The digital conversions of sound information are necessary for the processing or the digital transmitting of sound data: their accessing using computers or computer nets, phone calls through analogue lines and digital units, making of audio CD's.

The sound folders may be easily processed on the computer with the help of specific programs that allow the users to record, to reproduce, to edit or to mix sound waves from multiple sources. One of the most familiar applications for musical processing is **MIDI** (Musical Instrument Digital Interface), a standard digital interface that simulates different musical instruments and special effects, including sounds from nature or sounds made by different devices. This application also administrates the sounds. **MIDI** is a computer equivalent of the reproduction / creation of a sound partita and may be used by musicians as an instrument of development for sound sequences.

Many audio messages contain human speeches. In order to be efficiently transmitted by digital means, systems of voice generation and transmission were created. These systems use patterns of vocal systems which reduce the voice to several essential parameters with characteristic phonetic features.

The **mp3** format (short of **MPEG-1 Audio Layer 3**) means to simplify the complex process which leads to the creation or altering of the features of the sound folder, all these considering the human perception of sound. A human being cannot perceive sounds between 20 HZ and 16 kHZ but s/he is

also sensitive to sounds between 2-4kHZ. We may thus suppress sounds above 100HZ and those below 16 kHZ, preferring those which our ear is sensitive. To better understand the differences between the music of a CD and that from the radio, here are some relevant numbers: the number of bits in one second of music recorded on a CD is 128 kBs, while that of a tune from the radio is 64 kBs. The producing, obtaining and listening of sound folders in mp3 format is done with specialized soft. The transformation of a sound folder is done in two steps. In the first step the track is transformed into wave using for example the **Audio Grabber** soft. In the second step the **wave** will be converted in **mp3** using **Xing Mp3**. Downloading from the Internet usually requires the installation of a soft like the one provided by **Kazaa**. The listening is done with **Winamp** which has now reached the version 5.05 and is by far the most popular due to the provided facilities, the incorporated browser which can be used to find music on the web and the different plug-ins.

The sound is also presented on the Internet as an audio streaming, which is immediately activated at the end of a completed download. This format is more adequate for radio transmission and live concerts. Examples:

Specialized text:

• Eternal Egypt – Archaeological Site, http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.perform.type.search&language_id=1&trait_item_id=83004, (it requires Macromedia Shockwave Player)

• Florida Holocaust Museum, http://www.holocaustmuseum.org/tour_high2.cfm, (software Real Player)

• Imperial War Museum London, http://www.iwm.org.uk/, (software Real Player) (*Fig. 7*)

Music:

• Deutsches Museum, http://www.deutsches-museum.de/

c. Image documents

The digital static images are sequences of pixels which allow the representation of certain areas from the user's graphic monitor. A pixel is represented by a number that corresponds to a dot from the screen that has a certain light, colour and contrast. In the case of black and white images the pixels may have one of the binary values 0 or 1(a bit), indicating which of the two colours should be used on the screen. In the case of coloured images that have a great resolution, a pixel will be represented on 8, 16 or even 24 bits thus generating a wide range of colours and shades. The memory space required by the static images varies depending on resolution, size, complexity and the compression algorithm used.

Fig. 7.

Examples:

Panoramic views

• Deutsches Museum, http://www.deutsches-museum.de/,

Images (photo)

• National Music Museum, http://www.usd.edu/smm/galleries.html#Abell,

• Imperial War Museum London, http://www.iwm.org.uk/, (*Fig. 8*)

• National Museum of American Illustration, http://www.americanillustration.org/index.html

d. Film documents

The rewinding of video images is based on the succession of a certain number of static images that takes place every second. If at least 25 images are used per second, the human eye does not perceive the fact that the images are discreet, but continuous, in movement. This principle is at the basis of all movie making systems including television – with which it is essentially similar.

In a digital system each frame is represented as a rectangular grid of luminescent dots called pixels. For a black and white image one bit (0 or 1), is sufficient to represent a pixel. The shades of grey (in a standard number of 256), can be represented if each pixel is codified on 8 bits. Consequently, the preferred colour systems with 256 colours use again 8 bits for a pixel. Obviously, in order to represent a large number of colours, more bits should be used to codify each pixel, but the use of a large number of colours is irrelevant as the human eye can not distinguish the small differences between two close shades.

An image memorized by codifying each contained pixel is BIT Map type (BMP bit map) and has quite a big size. A much smaller format for memorizing images is GIF which is widely used. There are programs that allow the conversion of certain type of image representations into other types of representations.
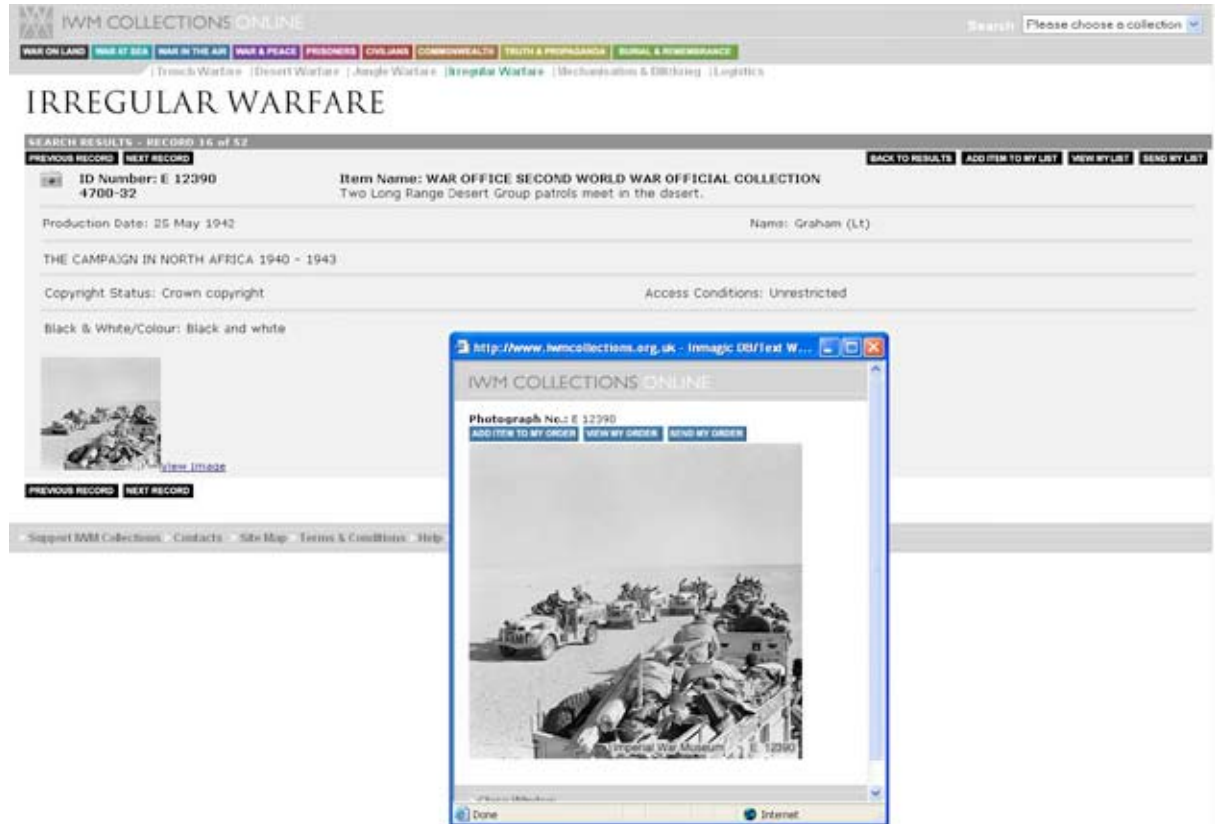

Fig. 8.

The usual configurations of computer monitors are 640x480 pixels (VGA), 800x600 pixels (SVGA), 1024x768 pixels (XVGA). This feature, given by the number of pixels on the screen, is called resolution. The ratio between the number of pixels on the horizontal and the vertical, which is important for the figure symmetry, is called aspect ratio and has the value 4/3. This ratio ensures compatibility between the electronic tubes of the monitor and TV sets.

The number of frames rewound per second for animated images, as in the analogous case, is at least 25. The high quality computer monitors redraw the screen 75 times/second, or even more often, and to avoid flickering, the same frame is displayed several times in a row. The process of repeated display is simplified by the fact that the screen image is memorized in a computer.

The film folders are available on the Internet in several known formats: **Microsoft Audio-Visual Interleave (AVI), Apple QuickTime and MPEG.** – Video technology designed by the same group as the **MP3**. Two free software programs which can be used for listening and watching are **Winamp** and **Windows Media Player 9**. **Windows Media Player** is a part of the same packet of programs as **Windows XP**, and **Winamp** can be easily downloaded from the Internet Most media players allow multiple formats, for example **Windows Media Player** provides limited **MP3** support besides **Windows Media Audio** also allowing the video formats **MPEG**.

Example:
• Deutsches Museum, http://www.deutsches-museum.de

e. Data processing programs

There is a wide range of automatic processing of information. They can be classified according to the type of information processed into:

• **Document processing** – refers to the text editing operations (writing and modifying), to which special processing facilities are added: formatting (structuring on pages, paragraphs, changing of aspect by the font and size of letters), linguistic operations such as separation of syllables, spelling and partial checking of syntax. The edited texts may be consulted on the screen, printed on paper, on plastic sheets etc., sent or eventually introduced in new processing. Most document editors (soft products that allow document editing) offer as extras facilities for creating and processing tables, formulae, images 2D and 3D graphic representations. Images and graphics and grids may be directly introduced from the document processor (the soft product news) or maybe taken from other applications: created with specialized soft products and 'imported' in the document editor. For example images are scanned and processed photos may be inserted in a document using a specific soft product (for example **PhotoShop).**

Examples of document editors: the most used editor is **Word** (from the *Microsoft Office* group of **Windows**), another editor less advanced used in **Windows** 95/98/NT/2000/XP is **WordPad**. The document processing can be done with the help of specialized typing programs such as **Ventura** or **Page Maker**.

• **Sound processing** refers to the human voice (messages, phone calls, conference recordings), to music, natural or electronically synthesized sounds. Sound information is converted from analogue form to digital form and then is digitally processed by programs and equipments specialized in processing of sound information.

In order to reproduce sounds, the computer must have a sound blaster: acoustic interfaces may be done by using analogue audio systems (cassettes player, tape player, CD reader) or with devices for acoustic

communication (telephone, interphone etc.). The soft products necessary for sound processing are the drivers for audio peripheral and programs that process sound folders, the most familiar being those from the systems Windows (**MIDI** in **Windows** 3.x and **Windows** '9x**, Sound Recorder** and **Media Player** in **Windows** '95/'98/NT/2000/XP).

• **Image processing** (static or animated images) completes the range of multimedia facilities. The most often used product form static image process is **Corel Draw** (subsystem **Windows**), but for less complicated processing we may use Paint from the group accessories. The easiest way to memorize an image is the bitmap. In the case of .**BMP** folders – this represents the screen as a matrix of pixels and encodes the colour of each pixel. Obviously, this type of memorizing leads to the making of quite large folders (measured in megabits). The **JPEG** (Joint Photographic Experts Group) standard was created due to the interest in creating a system of static image encoding that would simultaneously compress them.

The dynamic visual information is the result of display and perception of a number of successive images per time unit (at least 25 images/second). These give the viewer a feeling of movement. Obviously, the size of the folders that contain animated images will be much bigger than that of the folders that have static images. By encoding this information in a space as small as possible, and with irrelevant loss of information, the **MPEG** (Motion Picture Experts Group) standard was developed. This uses **JPEG** encoding for each frame. In order to compare the space necessary for memorizing static and dynamic images, we mention the fact that a film encoded in **MPEG** format takes up approximately 4GO. **JPEG** and **MPEG** were adopted as international standards in 1993.

Usually, processing of visual information is accompanied by the processing of sound information (for example with **Windows Media Player** we may do processing of the animation type with image folders and processing of sound folders).

The sources of video information are varied: images obtained with video cameras, images sent (analogical or digitally) through specialized communication systems, computer created images, which were done using various physical and logical programs. Each video device connected to the computer must also have a logic interface driver.

In the last years we may notice an increase in sound and image processing, increase that has developed the concept of multimedia systems. They contain physical equipment and soft products that facilitate the processing.

V. Analysing Internet Data

a. Web page evaluation methodology

Nowadays the Internet is a huge interactive library, where we can find text, sound or image information, all grouped in documents which bear the name of 'hypermedia documents'. The problem is that there is no organism to control the quality and the form of the data broadcast through the Internet. In a classic publishing house, the texts are checked beforehand by a specialist committee, while for radio and television there is centralized monitoring committees (in Romania – **CNA**[7], *Consiliul National al Audio-Vizualului*).

Despite the enormous managerial challenges of such a network, there is no supreme authority to govern it. However, there are a number of organizations based on voluntaries, having as a purpose the investigation of possible problems, and which can suggest measures for improvement.

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[7] http://www.cna.ro/

The *Internet Architecture Board*[8] *(IAB)* is such an organization. Its members meet regularly to consult about setting standards, allotting resources, or suggesting solutions in the short or the long term. Once a new standard is adopted, it is 'published' on the Internet and new applications will be built on it, with the purpose of ensuring a higher compatibility between architectures, operating systems, etc.

Another organization is *Internet Engineering Task Force*[9] *(IETF)*. Its members meet on a regular basis to discuss operational problems in the short term. When a problem arises, a workgroup is formed to investigate it exclusively and find solutions for improvement. A report is published at the end of each such investigation. Depending on its importance, it may become a simple source of information for anybody interested, it may be voluntarily accepted by anyone who considers the suggested solution as being a valuable one, or it may be sent to IAB to be set as a standard.

Several evaluation criteria for a web page have been imposed in time and are today accepted by the majority of specialists:

a. Accuracy of web documents. You should check:
   • Who wrote the page? Can you contact him or her?
   • What is the purpose of the document and why was it produced?
   • Is that person qualified to write this document?

b. Authority of web documents. You should check:
   • Who published the document?
   • Is he/she separate from the *webmaster*?
   • Check the domain of the document. What institution publishes this document?

c. Objectivity of web documents. You should check:
   • What objectives does this page meet?
   • How detailed is the information?
   • What opinions (if any) does the author express?

d. Currency of web pages. You should check:
   • When was it produced?
   • When was it updated?
   • Are the links (if any) up-to-date?

e. Coverage of the web documents. You should check:
   • Are the links evaluated? Do they complement the document's theme?
   • Is it a multimedia document? Does it contain text, image and sound?
     Is there a balance between text and image?
   • Is the information presented cited correctly? Does it have scientific notes?
   • Is there a list of the bibliography cited?

For examples, please see **Appendix 1** and **Appendix 2**.
If you follow the work methodology presented above, it will be easy for you to identify the scientific websites and benefit from the bibliography found.

b. Professional deontology and copyright. Webography

Professional deontology compels you to cite all data taken from a web page as in the case of scientific notes within the classic critical apparatus. According to international standards, the web page can be

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[8] http://www.iab.org/
[9] http://www.ietf.org/

quoted under *webography* with its author, title, exact web address and the date when you accessed the page.

Here is an example of regulations concerning copyright over text, images and sound, belonging to a public, academic cultural institution: *Smithsonian Institution*[10] in USA (see **Appendix 3**) and the scientific publication of a prestigious international congress: *CAA – Computer Applications in Archaeology 2004*[11] (see **Appendix 4**).

VI. Electronic ways of publishing

a. Portable Document Format (PDF)[12]

Portable Document Format (PDF) is the de facto standard for the secure and reliable distribution and exchange of electronic documents and forms around the world, with a ten-year track record. PDF is a universal file format that preserves the fonts, images, graphics, and layout of any source document, regardless of the application and platform used to create it. Adobe® PDF files are compact and complete, and can be shared, viewed, and printed by anyone with free Adobe Reader® software. To date, more than 500 million copies of the software have been distributed. You can convert any document to Adobe PDF using Adobe Acrobat® software products, enabling business, engineering, and creative professionals to create, distribute, and exchange secure and reliable Adobe PDF documents.

An open file format specification, PDF is available to anyone who wants to develop tools to create, view, or manipulate PDF documents. Indeed, more than 1,800 vendors offer PDF-based solutions, ensuring that organizations that adopt the PDF standard have a variety of tools to leverage the Portable Document Format and to customize document processes.

b. HTML theme web pages

A web page is a system of folders (of the type .html, .htm, .gif, .jpg, .zip, .xbm, .mav, .mid, .au, etc) in hypertext format, which makes up presentation pages on the WWW net and which can be accessed by any user connected to the Internet system in any place and at any time. The making of web pages is done using a specific description language, called HTML (HyperText Markup Language), invented by Tim Berners-Lee. Any web page must reflect the purpose for which it was created. The text, the images and the sounds must inform the user-client of the message meant to be transmitted; hence, the importance of making a web page for the WWW net that can be accessed by any user-client.

A HTML document is a text folder (ASCII) written in HTML language, which includes different text formatting, image formatting, sound modules, animation modules as well as hyperlinks to other HTML documents. A HTML document – actually a web page – can be accessed by any user-client connected to the Internet system through Web browsers such as Netscape Communicator, Internet Explorer, Mosaic (for Windows), Lynx (for Linux/Unix).

A theme web page designed for a museum must combine three of its functions: publishing and popularization, organizing virtual exhibitions, and cultural education. Although the museum may choose to present only one of these functions on the web, it is preferable that all three should be approached methodically. Usually, a museum web page is the work product of a team of specialists from the area of that particular museum and computer scientists. The theme of the virtual museum must reflect the area of expertise and the collections of the museum. The museum may, of course, choose to provide supplementary services of scientific character, such as access (free or by using a password) to its

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[10] http://www.si.edu/
[11] http://www.caa2004.org/
[12] after *What is Adobe PDF?*, http://www.adobe.com/products/acrobat/adobepdf.html

information and database. Whatever the area of activity and the theme of the museum, the Internet may be successfully used in promoting its activities, collections and scientific stuff. It is a modern way of active recreation and education of people (especially children) and it is also a source of income. For all these, the technical instruments that may be used by the webmaster are similar with those used in designing a regular website. The accent place on interaction and good quality graphics are perhaps the only features that require special attention, due to the specifics of a virtual museum.

c. Web robots: ways of publishing a web page on the Internet.

1. Registering in search engines

About Web Robots. What is a WWW robot? A robot is a program which automatically traverses the Web's hypertext structure by retrieving a document, and recursively retrieving all documents that are referenced. Note that 'recursively' does not limit its definition to a specific traversing algorithm. Although a robot applies certain heuristic calculations for selecting and commanding documents, and it displays the requests in a longer period of time, it remains a simple robot. Web browsers are not actual robots because they are managed by humans and do not automatically find the documents in their search (only images in documents). Web robots are also called **Web Wanderers, Web Crawlers,** or **Spiders**. These names are rather misleading as they give the false impression that the program itself moves among sites like a virus; a robot simply visits the sites by scanning ('reading') their documents.

How does the robot decide to visit a certain site? This depends on the robot because each one uses different strategies. In general they start from a historical (chronological) list of URLs, especially of documents with many links elsewhere, then '*What's New*?' pages, and the most popular sites on the Web. Most indexing services also allow you to submit URLs manually, which will then be queued and visited by the robot. Sometimes other sources for URLs are used, such as scanners through USENET postings, published mailing list archives, etc. Given these starting points, a robot can select the URLs to visit and index, to parse and use as a source for new URLs.

How does a robot determine what to index? If an indexing robot identifies a new document, it may decide to parse it, and insert it into its database. How this is done depends on the robot; some robots index the HTML titles, or the first few paragraphs, or parse the entire HTML and index all words, with weightings depending on HTML constructs, etc. Some parse the META tag, or other special hidden tags. We hope that as the Web evolves, more facilities become available to efficiently associate META data (as indexing information) with a document.

How do I register my page with a robot? It all depends on the server. Most services have a link to a URL submission form on their search page. It usually is something like: '**Add Url'**, '**Suggest a Site**', '**Add Your Page**', etc. You have to search on the page or use the engine's **Help**. There are also automatic registering services. One of them is **Submit Express** (http://www.submitexpress.com), but, unfortunately, you would have to pay for it.

Why is it important for you to pay attention to the manner of building a web page? On May 15th 1999, Forester Research calculated that there were between 500 and 600 million web pages. The biggest search engine (**Alta Vista**) lists only 150 indexed pages. *Why*? The Web network expands too quickly and a large number of web page creators do not register their pages. This means trouble, but it is at the same time an opportunity for web page creators. Search engines are overloaded; they contain too many pages and can hardly cope with ensuring the information researched by the users. It often happens that a good web site is ranked with a minimum level of priority by the search engine, while another web site poorer in quality is appreciated at the maximum level (at the head of the lists displayed by the search engine). Research has proven that people manage to check only up to 30

results from the lists displayed by the search engine. The first 10 results receive 78% more traffic than those on positions 11–30. The first 30 results receive over 90% of the search traffic percentage. Thus it can be explained why some sites do so well and others can be so disappointing.

There is a total number of 450–650 words suggested for the whole page. Many search engines penalize for too many or too few words on a page. According to our research, your own page can be better ranked by the search engine if the number of words is within the above-mentioned limits.

a. Title Tag *(one keyword frequency on a title)*

Your web page <TITLE> tag is the most important tag or HTML element. All search engines consider the keywords of this tag and generally give them great weight in their ranking system. However, if you were to create a web page with a keyword in the title tag and another page with the same keyword in the <BODY> tag, you could notice that the one with the title tag would be better ranked than the one with the <BODY> tag. Many search engines use the HTML <TITLE> tag as your web page description when they search for the user's query. This would mean that the HTML tag should not only work to your advantage in ranking the keywords, but also to be attractive enough for the reader. There are two elements characteristic for every web page on the search engine results page.
• The page title in blue and an active link leading to the site.
• Brief description of the page.

Both must of course be as short and concise as possible, but the <TITLE> tag benefits from a special relevancy because many search engines still use it exactly as it appears on your page. The page description which you offer in the META description tag shall be used by some search engines, but not by others. This is why the <TITLE> of the page is more important than the META description.

Suggestions for title tag:
• Always use primary keywords in the title tag at least once or twice.
• Try to place the keywords at the beginning of the tag.
• Avoid repeating the same keyword in a row because some search engines shall penalize you for it. Instead you may use the keyword several times but separated by other words.
• Use the longer and plural forms of a keyword when this is possible.
• Use small or capital letters (**Upper/Lower**) to type the keyword.
• Longer names are more satisfactory than short ones. However, the shorter ones can be used if you want to highlight a keyword which is difficult to promote, or if the search engine favours pages with shorter titles.
• Create a title short and interesting for the reader so as to persuade him/her to click on that link.

b. Meta Keyword Tag *(one keyword frequency for META Keyword tag)*

The purpose of this tag is to define what keyword is applicable to your page. Only few search engines will read this tag, and the ones that do it often give it little importance considering it a keyword found in other sections of the page. You should, however, include a keyword META tag in the <HEAD> section. A keyword META tag example would be the following: **<META name="keywords" content="ancient history, medieval history, modern history, Romanian History">**. Each keyword or phrase must be separated by commas. In general you should type keywords in small letters. Avoid repetition of keywords more than 3–7 times and never type the same keyword several times in a row (one after the other). It is suggested to use a number of 4 – 23 words for META keyword section description.

c. Meta Description Tag *(3–11 keyword frequency for META Description)*

The text in the META Description tag will be displayed for the user at the end of the research. So the text of the description is very important for a higher ranking as well as for a more frequent visiting of your site by users. META Description tag example: **<META name="description" content="Place paragraph text here.">**. This tag will appear in the <HEAD> section.

Most important addresses and registering methods with the main search engines:

Alta Vista	Uses Meta tags; a registration no longer than a page is recommended. http://www.altavista.com/
Hotbot	The principal factors affecting page priority are: title words, Meta Keywords, words frequency in documents, document length. There is a 60 days waiting period. http://www.hotbot.com/addurl.asp
Excite	Does not use Meta tags, the Home page is imported. There is a two-week waiting period. http://www.excite.com/
Lycos	You can register multiple pages. There is a two- to three-week waiting period after the robot's visit. http://www.lycos.com/addasite.html
Magellan	There is a two-week waiting period. It does not use Meta tags. The Home page is imported. http://magellan.excite.com/
Infoseek	One page only shall be indexed. To register up to 50 URLs each URL is entered separately on their page. A URL can be entered once in 24 hours. There is a waiting period of one day. http://www.go.com/AddUrl?&pg=SubmitUrl.html

Free hosting is already being practised in Romania, but it is used on a larger scale in countries where the state supports the Internet suppliers' activity through economic measures which favour the access to the Internet for public institutions and schools, or through considerable cuts in local telephone fees so as to offer everybody unrestricted access to communication. Many servers provide free services because they have much higher revenues from sales, and the hosted pages are only those things which attract visitors to the advertisements published on that server. The servers which host web pages for free sometimes impose certain restrictions (for instance, no commercial activities are allowed on those pages) and require that the page owner manages his/her webpage by himself/herself.

So you can easily find a hosting server, either for free or for a certain fee. Or, it can even be difficult to choose the server to host your web page in case you decide to publish a personal page or one for the company where you work. However, there are some clear criteria to help you decide more easily in solving the hosting problem:

• If you do not have money to pay the fee, you would probably have to choose a free server. In this case you are setting yourself the task of doing all the necessary operations if you know what there needs to be done, or you can ask for a friend's help. You have to choose the most adequate server for your page, keeping in mind that it should be accessible enough from the area from which you want the page to be seen, that it should allow you to place and manage the web page from a distance in good conditions, and that it should allow you the freedom to enter on the page what you want to publish.

• If you want to leave to somebody else all the technical aspects, the most qualified persons to do it are the specialists who manage the server on which you choose to publish your web page. The closer the server is to you (geographically speaking), the easier it will be for you to keep in touch with them and work well together so that your page would be published and updated, and, possibly, popularize it on the Internet. As usual, direct relation to people is the most effective form of collaboration.

Here is a list of some of the most popular servers which host web pages for free:
• **Yahoo-Geocities** (http://www.geocities.com)
• **Tripod** (http://www.tripod.lycos.com)
• **Top Cities** (http://www.topcities.com)
• **Xoom** (http://www.xoom.com)
• **Webjump** (http://www.webjump.com)
• **Free Servers** (http://www.freeservers.com)

We shall make no comment on the quality of services offered by them, but there are also sites which offer lists of servers with free hosting, completed and with exact data about the allotted space, and other additional services that these servers provide. Such a list is the one at the **Free Web Hosting** site (http://www.free-webhosts.com/).

2. Registering in portals and public and institutionalized directories

A virtual museum is meant to promote culture. Due to this feature, it is the beneficiary of special attention from the international scientific forums and also from the public and private ones. These institutions consider facilitating the access to culture a moral duty. In order to accomplish this purpose there are international projects, funding from local public administration and private foundations, which offer material support to promoting museums. This is one of the reasons almost all portals and directories (may they be public, private or institutionalized) provide free hosting for museum web pages and free promotion through hyperlinks.

In most cases, a simple e-mail addressed to the web master of a portal or directory is enough to register a museum web page within it. The only recommendation is the quality of the information and the presentation of the museum. Sometimes it is the portal itself which identifies and updates the list of museums hosted on the web, creating a link to it does not affect the copyright.

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Appendix 1
Evaluating a popularizing web document

1. Document title: **Scrisoarea lui Neacsu din Campulung** (The Letter of Neacsu from Campulung) **(1521)**
2. Author: a group of students from the University of Bucharest, led by Irina Oberlander-Tarnoveanu
3. Web master: Cornelia Calin
4. Document type: an informative synthesis study
5. Scientific supervisors: Irina Oberlander-Tarnoveanu
6. Format: HTML
7. Language: Romanian
8. Web address: http://www.cimec.ro/Istorie/neacsu/rom/default.htm

I. Accuracy of web document

1. *the web page is built* by a web master who can be contacted at cornelia@cimec.ro
2. *the purpose of the document* is to present in electronic format, full text, **Scrisoarea lui Neacsu din Campulung (1521)** together with a short presentation of Neacsu and his epoch
3. there are no links to the authors' CVs

II. Authority of web document

1. *the document is published by the web master*
2. *domain*: Romanian Medieval History; *subdomain*: archivistics
3. the publishing institution: CIMEC Institutul de Memorie Culturala (Cultural Memory Institute)

III. Objectivity of web document

1. the objectives of the document: a synthesis presentation for popularizing the first document written in Romanian
2. the information is detailed in 3 chapters and subchapters connected through hyperlinks:
   a. Scrisoarea (the letter proper)
   b. Lumea lui Neacsu (Neacsu's world)
   c. Neacsu – comerciantul (Neacsu the merchant)
3. the study has minimum archivistic references and its analysis and interpretation do not express the authors' opinions; it is a mere compilation

IV. Currency of web document

1. the web document was produced on March 3rd, 2000
2. it has not been updated because the document does not require this; it is a 'closed' document
3. there are only internal links to navigate within the document; it does not require hyperlinks to external mail or web addresses

Appendix 2
Evaluation of a Scientific Web Document

1. Document title: **The Anatomy of a Historical Conflict: Romanian-Hungarian Diplomatic Conflict in the 1980s**
2. Author: Constantin Iordachi
3. Web master: not specified (irina@cimec.ro)
4. Document type: PhD thesis
5. Scientific coordinators: Sorin Antohi, Maria Kovacs
6. Format: HTML
7. Language: English
8. Web address: http://www.cimec.ro/Istorie/Cristi/Cuprins.htm

I. Accuracy of web document

1. *the web page is built* by an unspecified web master who can however be contacted at irina@cimec.ro
2. *the purpose of the document* is to present in electronic format, full text, Constantin Iordachi's PhD thesis entitled **The Anatomy of a Historical Conflict: Romanian-Hungarian Diplomatic Conflict in the 1980s**
3. *there is a link to the author's CV*

II. Authority of web document

1. *the document is published by the web master with the scientific author's consent and review of the study*
2. *domain*: Romanian Contemporary History; *subdomain*: diplomatic relations of Romania and Hungary in the 80s
3. the publishing institution: CIMEC, Institutul de Memorie Culturala (Cultural Memory Institute)

III. Objectivity of web document

1. the objectives of the document: exhaustive presentation of Romanian-Hungarian relations in the 1980s
2. the information is detailed in 5 chapters and subchapters connected through hyperlinks:
   a. Communism and Nationalism in Romania and Hungary
   b. Foreign Policy: Two Different Cases
   c. The Romanian-Hungarian Diplomatic Conflict in the 1980's. Origin and Evolution (1)
   d. The Romanian-Hungarian Diplomatic Conflict in the 1980's. Origin and Evolution (2)
   e. Conclusions
3. the study has an enormous archivistic reference section and its analysis and interpretation express the author's opinions

IV. Currency of web document

1. the web document was produced on January 5th, 1999
2. it has not been updated because the document does not require this; it is a 'closed' document
3. thereareonlyinternallinkstonavigatewithinthedocument;itdoesnotrequirehyperlinkstoexternalmail or web addresses

Appendix 3
Smithsonian Institution, http://www.si.edu/, [accessed 03.09.2004] Smithsonian's Office of Product Development and Licensing

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Appendix 4
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Appendix 5
Museums

a. Professional Associations

a.1. International

1. **Museums Association**, http://www.museumsassociation.org/ixbin/hixclient.exe?_IXSESSION_= &su_bmit-button=search&search-form=html/ma_home.html, The MA is the oldest museums association in the world. It was set up by a small group of museums in 1889 to look after the interests of museums and galleries. The MA provides information through its website and publications, lobbies government and sets ethical standards through its policy department, and offers a comprehensive professional development programme for members wishing to further their careers in museums and galleries. In addition to this, the MA runs a series of events around museum issues, and holds an annual conference which focuses on current issues and policies affecting museums and galleries. The MA now has approximately 5,000 individual members, 600 institutional members and 250 corporate members.

a.2. National

1. **Deutscher Museumsbund**, http://www.museumsbund.de/, The German Museums Association is dedicated to the interests of the museum community in respect to their collections as well as to research and education. The German Museums Association is especially dedicated to museums having the necessary personnel and financial prerequisites. Giving advice to its members as well as to authorities such as government boards, corporations and associations in questions that are of concern to museums public relations. In cooperation with regional museum associations and international organizations the German Museums Association aspires the promotion of museums as well as the recognition of the valuable und educational role museums play.

2. **American Association of Museums**, http://www.aam-us.org/, Founded in 1906, the American Association of Museums (AAM) is dedicated to promoting excellence within the museum community. Through advocacy, professional education, information exchange, accreditation, and guidance on current professional standards of performance, AAM assists museum staff, boards, and volunteers across the country to better serve the public. AAM is the only organization representing the entire scope of museums and professionals and nonpaid staff who work for and with museums. AAM currently represents more than 16,000 members--11,500 individual museum professionals and volunteers, 3,100 institutions, and 1,700 corporate members. Individual members span the range of occupations in museums, including directors, curators, registrars, educators, exhibit designers, public relations officers, development officers, security managers, trustees, and volunteers.

3. **Irish Museums Association**, http://www.irishmuseums.org/, The Irish Museums Association is a voluntary, not for profit organisation dedicated to promoting the interests of museums and those who work in them throughout Ireland, both north and south. The IMA organizes an annual seminar in February and publishes several newsletters and a Museum Journal each year. The Association also organizes lectures and special events in collaboration with other museum-related bodies. We welcome as members anyone working in, or with an interest in, Irish museums.

4. **De Nederlandse Museumvereniging**, http://www.museumvereniging.nl/, The Netherlands Museums Association (Nederlandse Museumvereniging, NMV) looks after the interest of the museum sector and acts as the representative organ of Dutch museums. The NMV is also active in stimulating knowledge and skills by organizing courses and workshops. It initiates debates and policy development, gives

advice, spreads information and issues publications. In addition, the NMV offers marketing support to museums and promotes museums in general.

5. **Suomen museoliitto**, http://www.museoliitto.fi/, Established in 1923, the Finnish Museums Association is the central organisation of Finnish museums. The Association works to improve the operating conditions of museums by: safeguarding the interest of the museums, supporting the development of museums, promoting co-operation between museums, encouraging the use of expertise in the museums, raising the public awareness about museums. The Finnish Museums Association participates in development of legislation, museum work and the financial status of museums, for example, by participating in the Ministry of education working group on digitalization of the cultural heritage. The Association gives also expert opinions.

6. **Latvijas Muzeju Asociācijas**, http://www.muzeji.lv/, The website of the Latvian Museum Association is an online information centre for everyone interested in the culture and history of Latvia. (is an Portal)

7. **The Swedish Museums Association**, http://www.museiforeningen.se/, The Association for museums, museum employees and professionally-trained museum personnel. The Association is a joint working forum for the different types of museums in Sweden, and is active in the fields of training and information within the museum sphere. The Swedish Museums Association publishes a journal, Svenska Museer (Swedish Museums), through the medium of the Internet, and provides up-to-date information via Svenska museer Direkt (Swedish Museums Direct). The Swedish Museums Association works actively for the strengthening of professionalism in the museum world and strives to encourage exchange of ideas and debate.

8. **The Lithuanian Museum Associations**, http://www.museums.lt/, The main purpose of the LMA is to generally support museum activities and to organize as well as promote cooperation and mutual assistance among museums.

9. **Canadian Museums Association**, http://www.museums.ca/Cma1/About/AboutCMA.htm, The Canadian Museums Association is the national organization for the advancement of the Canadian museum community. We unite, represent and serve museums and museum workers across Canada. We work passionately for the recognition, growth and stability of our sector.

10. **Verein Zürcher Museen**, http://www.museen-zuerich.ch/, The association of Zurich museums–Verein Zürcher Museen–informs and orientates you about what is happening where and when. It is the official organ for joint public relations and information services of all affiliated museums. We ascertain, check and update our information on a monthly basis.

11. **Ассоциация музеев России**, http://www.amr-museum.ru/.

b. National Museums

1. **Kabul Museum**, http://www.afghan-web.com/kabul-museum/, Afganistan
2. **Bahrain National Museum**, http://www.bnmuseum.com/index.htm, Bahrain
3. **Cayman Islands National Museum**, http://www.museum.ky/, Cayman Islands
4. **Chiang Saen National Museum**, http://www.thailine.com/thailand/english/north-e/chrai-e/attrak-e/at-sae-e/natmus-e.htm, (slab) Thailand
5. **Bangladesh National Museum**, http://www.bangladeshmuseum.gov.bd/, Bangladesh
6. **National Museum**, http://www.nm.cz/english/, Czech Republic
7. **Estonian National Museum**, http://www.erm.ee/, Estonia
8. **The National Museum of Denmark**, http://www2.natmus.dk/, Denmark
9. **Germanisches Nationalmuseum**, http://www.gnm.de/indexE.htm, Germany
10. **Greenland National Museum**, http://www.natmus.gl/, Greenland
11. **National Museum**, http://www.saudimuseum.com/, Saudi Arabia,
12. **Kunsthistorisches Museum Vienna**, http://www.khm.at/homeE/homeE.html, Austria
13. **Kzoto National Museum**, http://www.kyohaku.go.jp/eng/index_top.html, Japan

14. **Louvre Museum**, http://www.louvre.fr/, France
15. **Magyar Nemzeti Múzeum**, http://www.hnm.hu/, Hungary
16. **Musée National de Monaco**, http://www.monte-catrlo.mc/musee-national/, Monte-Carlo
17. **Museum of New Zealand Te Papa Tongarewa**, http://www.tepapa.govt.nz/TePapa/English/, New Zeeland
18. **National Museum in Warsaw**, http://www.mnw.art.pl/, Poland
19. **National Museum of Slovenia,** http://www.narmuz-lj.si/index.html**,** Slovenia
20. **The National Czech & Slovak Museum & Library**, http://www.ncsml.org/,
21. **National Heritage Board**, http://www.museum.org.sg/MCC, Singapore
22. **National Museum of Gondwana**, http://pro.wanadoo.fr/europa.france/museum/, France
23. **National Museum Accra**, http://www.geocities.com/gmmbacc/, Ghana
24. **National Museum Directors' Conference, Imperial War Museum**, http://nationalmuseums.org.uk/index.html, Great Britain
25. **Smithsonian Institute**, http://www.si.edu/, USA
26. **National Museum of Australia**, http://www.nma.gov.au/, Australia
27. **National Museum, NewDelhi**, http://www.nationalmuseumindia.org/, India
28. **National Museum of Iran**, http://www.nationalmuseumofiran.com/, Iran
29. **National Museum of Ireland**, http://www.museum.ie/, Ireland
30. **National Museum of Japanese History**, http://www.rekihaku.ac.jp/, Japan
31. **National Museum of Namibia**, http://www.natmus.cul.na/, Namibia
32. **National Museum of Ras al-Khaimah**, http://www.rakmuseum.gov.ae/m, United Arab Emirates
33. **National Museum of Rome**, http://www.roma2000.it/zmunaro.html, Italy
34. **National Museums and Galleries of Wales**, http://www.nmgw.ac.uk/, Great Britain
35. **National Museums Liverpool**, http://www.liverpoolmuseums.org.uk/, Great Britain
36. **National Museums of Kenya**, http://www.museums.or.ke/, Kenia
37. **National Museum of Scotland**, http://www.nms.ac.uk/, Great Britain
38. **Nationalmuseets**, http://www.natmus.dk/, Denmark
39. **Staatliche Museen zu Berlin**, http://www.smb.spk-berlin.de/e/index.html, Germany
40. **The British Museum**, http://www.thebritishmuseum.ac.uk, Great Britain
41. **The Manchester Museum**, http://www.museum.man.ac.uk/, Great Britain, **National Museum of History in Sofia**, http://www.historymuseum.org/, Bulgaria
42. **The National Museum of Western Art, Tokyo**, http://www.nmwa.go.jp/, Japan
43. **Nationalmuseum**, http://www.nationalmuseum.se/, Sweden
44. **Vatican Museums**, http://mv.vatican.va/3_EN/pages/MV_Home.html, Vatican
45. **Museums of Russia**, http://www.museum.ru/, Rusia

c. Network Museums

1. **Les musées en Wallonie**, http://www.lesmuseesenwallonie.be/html/index.php, Belgium
2. **Muséofile**, http://museofile.culture.fr/, France
3. **Museen in der Schweiz**, http://www.museums.ch/,
4. **MuseumNet**, http://www.museums.co.uk/, Great Britain
5. **Museum Computer Network**, http://www.mcn.edu/resources/index.htm, USA

d. Romanian Museums

1. **Muzeul Național al Satului "Dimitie Gusti"**, http://www.muzeul-satului.ro/, Bucharest
2. **Muzeul Județean Maramureş**, http://www.muzeumm.baiamare.rdsnet.ro/index.htm, Baia Mare

3. **Memorialul Victimelor Comunismului si al Rezistentei**, http://www.memorialsighet.ro/ro/muzeu.asp, Sighet
4. **National Museum of Art of Romania**, http://art.museum.ro/, Bucharest
5. **Complexul Naţional Muzeal "Astra"**, http://www.muzeulastra.ro/, Sibiu
6. **Muzeul de Etnografie Braşov**, http://www.etnobrasov.ro/, Braşov
7. **Muzeul Militar Naţional**, http://muzeu.mapn.ro/, Bucharest
8. **Muzeul Naţiomal Brukenthal**, http://www.brukenthalmuseum.ro/, Sibiu
9. **Muzeul Naţional de Istorie a României**, http://www.mnir.ro/, Bucharest
10. **Muzeul Naţional de Istorie a Transilvaniei**, http://www.museum.utcluj.ro/, Cluj Napoca
11. **Muzeul Naţional de Istorie Naturală "Grigore Antipa"**, http://www.antipa.ro/, Bucharest
12. **Muzeul Literaturii Române**, http://www.mlr.ro/, Bucharest
13. **Muzeul Naţional Peleş**, http://www.peles.ro/, Sinaia
14. **The Museum of the Romanian Peasant**, http://www.muzeultaranuluiroman.ro/, Bucharest
15. **Muzeul Virtual al Monumentelor Etnografice din România**, http://www.cimec.ro/Monumente/aer/aeretn.htm, CIMEC, Bucharest.

e. Virtual Museums

1. **Discovery Center Museum**, http://www.discoverycentermuseum.org/,
2. **Florida Holocaust Museum**, http://www.flholocaustmuseum.org/,
3. **Jimmy Carter Library & Museum**, http://www.jimmycarterlibrary.org/tour/,
4. **Leonardo @ the Museum**, http://www.mos.org/leonardo/museum.html,
5. **Louvre**, http://www.louvre.fr/,
6. **The Franklin Institute Online**, http://sln.fi.edu/index.html,
7. **Lower East Side Tenement Museum**, http://www.tenement.org/Virtual_Tour/index_virtual.html,
8. **State Hermitage Museum**, http://www.hermitagemuseum.org/html_En/08/hm88_0.html,
9. **Australian Museum**, http://www.amonline.net.au/virtual_tour/,
10. **Hunterian Museum**, http://www.hunterian.gla.ac.uk/,
11. **Oxford University Museum of Natural History**, http://www.chem.ox.ac.uk/oxfordtour/universitymuseum/#,
12. **Wood Library-Museum**, http://www.asahq.org/wlm/VirtualTour/homepage.html,
13. **The Lost Museum**, http://www.lostmuseum.cuny.edu/,
14. **Toshiba Virtual Science Museum**, http://museum.toshiba.co.jp/index_3.html,
15. **Olympic Museum**, http://www.olympic.org/uk/passion/museum/virtual/index_uk.asp,
16. **Israel Bible Museum**, http://www.israelbiblemuseum.com/,
17. **John D. Calandra Italian American Institute Museum**, http://qcpages.qc.edu/calandra/museum/index.html,
18. **Oriental Institute Museum**, http://oi.uchicago.edu/OI/MUS/QTVR96/QTVR96_Tours.html,
19. **The Kelsey Museum of Archaeology**, http://www.lsa.umich.edu/kelsey/galleries/Exhibits/Big_Textile/Big_Textile/PREVIOUS_TEXTILE_EXHIBITS/PREVIOUS_TEXTILE_EXHIBITS.html,
20. **Chewelah Museum**, http://www.chewelahmuseum.org/,
21. **Russian Museum**, http://www.rusmuseum.ru/eng/museum/,
22. **Van Gogh Museum**, http://www.vangoghmuseum.nl/cgi-bin/virtual-tour/login.asp,
23. **The Virtual Biochemistry Laboratory,** http://cti.itc.virginia.edu/~cmg/virtualLab.html**,**
24. **Higgins Armory Museum**, http://www.higgins.org/,
25. **Logan Museum**, http://www.beloit.edu/~museum/logan/collections/online/,
26. **Maine State Museum**, http://www.maine.gov/museum/exhibits/index.html,

27. **Eternal Egypt**, http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.display.home&language_id=1

f. Domain Museums

a. **Art**
1. **Art Museum of the Americas,** http://www.museum.oas.org/
2. **Guggenheim Museum New York**, http://www.guggenheim.org/new_york_index.shtml, muzeu de arta contemporana
3. **Musée national des beaux-arts du Québec**, http://www.mnba.qc.ca/,
4. **Musée National d'Histoire et d'Art**, http://www.mnha.public.lu/
5. **National Museum of Contemporary Art, Korea**, http://www.moca.go.kr/Modern/eng/,
6. **The Metropolitan Museum of Art**, http://www.metmuseum.org/home.asp,

b. **Archaeology**
1. **Ancient Egypt,** http://www.ancientegypt.co.uk/menu.html**,**
2. **The National Museum of Ireland – Archaeology**, http://www.museum.ie/archaeology/,
3. **National Archaeological Museum of Athens,** http://www.culture.gr/2/21/214/21405m/e21405m1.html
4. **The Potteries Museum & Art Gallery**, http://www2002.stoke.gov.uk/museums/pmag/index.html,

c. **Natural History**
1. **Naturalis – National Museum of Natural History Laiden,** http://www.naturalis.nl/asp/page.asp?alias=naturalis.eng**,**
2. **American Museum of Natural History**, http://www.amnh.org/,
3. **Smithsonian National Museum of Natural History**, http://www.mnh.si.edu/
4. **National Museum of Natural Science**, http://www.nmns.edu.tw/eng_version.html,
5. **Staatliches Museum für Naturkunde Stuttgart**, http://www.naturkundemuseum-bw.de/cgi-bin/index.php3,
6. **The Natural History Museum**, http://www.nhm.ac.uk/,

d. **Weapons and military equipment**
1. **Higgins Armory Museum**, http://www.higgins.org/, colecţie de arme şi armuri
2. **The National Museum of Military History in Diekirch, Luxembourg**, http://www.luxembourg.co.uk/NMMH/,

e. **Castles and Palaces**
1. **Chateau de Versailles,** http://www.chateauversailles.fr/**,**
2. **York Castle Museum,** http://www.yorkcastlemuseum.org.uk/,
3. **Muzeul Naţional Peleş**, http://www.peles.ro/

f. **Ethnology**
1. **Cherokee National Museum,** http://www.powersource.com/heritage/museum.html
2. **National Museum of Ethnology,** http://www.minpaku.ac.jp/english/exhibitions/**,**
3. **Smithsonian National Museum of African Art's**, http://www.nmafa.si.edu/
4. **Smithsonian National Museum of the American Indian,** http://www.nmai.si.edu/

g. **History**
1. **Dover Museum,** http://www.dover.gov.uk/museum/

2. **Cairo Museum of Egyptian Antiquities**, http://www.egyptsites.co.uk/lower/cairo/museums/antiquities.html
3. **Smithsonian National Museum of American History**, http://americanhistory.si.edu/,
4. **Imperial War Museum London**, http://www.iwm.org.uk/
5. **Museum of Science**, http://www.mos.org/,
6. **National Museum of Patriotism**, http://www.museumofpatriotism.org/,

h. **Science and tehnique**
1. **Deutsches Museum**, http://www.deutsches-museum.de/
2. **National Music Museum**, http://www.usd.edu/smm/,
3. **Israel National Museum of Science**, http://www.mustsee.co.il/#,
4. **National Museum of Health and Medicine**, http://nmhm.washingtondc.museum/,
5. **National Museum of Science and Technology,** http://www.museoscienza.org,
6. **Canada Science and Technology Museum**, http://www.sciencetech.technomuses.ca/,
7. **Science Museum**, http://www.sciencemuseum.org.uk/,

i. **Personalities**
1. **Freud Museum,** http://www.freud.org.uk/**,**
2. **Jimmy Carter Library & Museum**, http://www.jimmycarterlibrary.org/tour/,
3. **Leonardo @ the Museum**, http://www.mos.org/leonardo/museum.html

Students' Presentations

Virtual Reconstruction of Museum Exhibits
General Presentation and Project [1]

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General Presentation

A virtual reconstruction is a realistic view of something that was in a certain period and which cannot be reconstructed without high expenses and great efforts. This means using a deal of modalities and software which can offer a 3D image of an exhibit that at present has a certain condition of decomposition.

The purpose of these technical and software implementations is to show the object in a different shape, closer to reality, because of the time passing and of the limited possibilities to conserve it, it is hard to imagine the object in his natural state (for example to show a bird as being alive, moving, not stuffed as in usual way of preserving dead living being, or to show a complete spear for the rust one).

The possibilities are very large, on a skeleton of a long-gone creature from a distant epoch, the whole body can be digitally built, showing a revealing representation of it, or antique monuments which were destroyed by time passing, wars, and natural catastrophes can be re-built.

The pictures and technical data are taken from the websites given as examples. These sites represent the information and definition source for the presentation.

CAD – means Computer Aided Design, the connection between a human user and a computer for drawing with the help of the Mouse, no pencil, using a variety of functions and graphic instruments based on geometrical and trigonometrically concepts, showing a 2D and a 3D picture.

Fig. 1. Building reconstruction with a CAD Software

Related websites:
- Old-Computers.Com – On-line museum since 1995, http://www.old-computers.com.
- State Hermitage Museum, http://www.hermitagemuseum.org
- Technology Museum of Thessaloniki, http://www.tmth.edu.gr/en/index.html
- Die München ISK Gruppe, http://www.isk-muenchen.de
- Lava 3D Modelshop, http://lava.ds.arch.tue.nl/modelshop

3D Laser Scanning – Laser Scanning which allows the reconstruction of surfaces and 3D bodies through the transfer of the data to a computer and transforming it with the help of special software, with a great amount of scanning precision points, generating realistic illustrations of complex structures (*Figure 2–3*).

Examples of 3D Laser Scanning websites related to museums:
- Canadian Museum of Nature, http://www.nature.ca/prodserv/3dcntr/3dtchnlgy_e.cfm
- ArcTron – Engineering Services for 3D Surveying and Archaeology, http://www.arctron.com

Fig. 2. Original view and 3D Laser Scanned view   *Fig. 3. Laser 3D Scanning Software*

I-Site 3D Laser Scanning,
http://www.isite3d.com/
• Archaeoptics, http://www.archaeoptics.co.uk

Photogrammetry – is a method of digital editing and rectifying images which uses a series of control points applied on individual images which are edited and assembled in a continuous slideshow of 2D images (*Fig. 4*).

Examples of Photogrammetry websites:
• Ancient Egypt Science & Technology, http://www.mos.org/quest/mummy3d.php
• Zoological Museum Amsterdam, http://ip30.eti.uva.nl/zma3d

Virtual Reality (VRML) – is an artificial medium which includes a large variety of technologies and equipments which generate sensations for the human senses. To access a virtual medium, special gloves, glasses and headphones are needed to connect to the computer, to offer the needed sensations and to receive feed-back (*Fig. 5*).

Examples of related websites:
• The Natural History Museum, http://www.nhm.ac.uk/
• Civilization.ca – Inuit 3D, http://www.civilization.ca/aborig/inuit3d/vmcinuit_e.html
• Virtuelles Museum – Neue Gemäldegalerie Berlin, http://www.sdf.de/gemaeldegalerie-smpk

Fig. 4. Image presenting a revolving bird and a list of features

Fig. 5. The Natural History Museum,
Virtual Reality Exhibit

Fig. 6. 3D Glasses

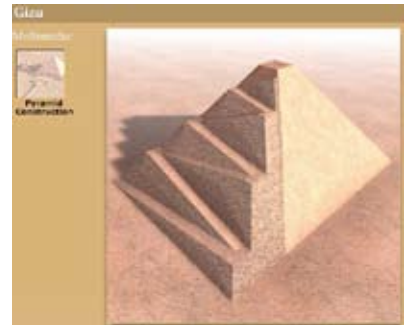
Fig. 7. 3D image when seen
through 3D Glasses

Fig. 8. A 3D reconstruction movie of a
Pyramid, www.eternalegypt.org

3D Glasses – are the glasses with red and blue lenses which allow the 3D visualization of 3D conceived objects, images, movies (*Fig. 6–7*).

Examples of related websites:
• 3D by Dan Shelley – 3D Image Library, http://www.dddesign.com/3dbydan/3dimages/images30.htm
• 3D Images from Dinosaur Museum, http://www.pvisuals.com/dinosaur_museum/3d.html
• Anagraph Advanced Plastic Anagliph 3D Glasses and Anachrome 3D Technology, http://www.anachrome.com

3D Movies – are done digitally in a 3D graphic structure with the help of the 3D Graphic Software (*Fig. 8*)

Examples of related websites:
• Canadian Museum of Nature, http://www.nature.ca/discover/3dcntr/chsyport_e.cfm#targ1
• Eternal Egypt, http://www.eternalegypt.org

Project

The project I am working at, in the West University of Timişoara, is meant to achieve a realistic reconstruction of the grey pottery from Tibiscum (at present Jupa village, Caraş Severin County), dated between 2nd and 4th century A.D. This paper-work is carried out for my Master Thesis on this theme, co-coordinated by Professor Doina Benea.

I am working with AutoCAD and I am using the hand made drawings made by the archaeologists. The drawings are scanned, inserted in AutoCAD and the future 3D reconstruction begins to shape by marking the contour of the object with a poly-line margin. The points are then united, shaped and rounded according to the real object, in order to respect its properties at a scale.

The advantage is that the software can respect measurements, dimensions, scales and it can measure different data: volume, mass, density. Also, textures taken from the original pottery (throughout digital photography) can be imported and applied on the object in order to create an advanced 3D model that respects the reality once known by our ancestors. Even parts of the original object can lead to the whole reconstruction using typology catalogues, such as Olga Brukner's.

When the 3D view is finished there are more effects that can emphasize an imaginative look over the original object, such as: 3D revolution (inside your drawing pad), 2D images of the object, and you can use the camera of this software to create a video animation. Now we have a complete and realistic description of the original.

This image can help a curator to show ceramic pots to visitors in a museum, and also it can help the reconstruction of the real object in the classical way.

This is very important for us to understand the phenomena and the way of modelling pottery in that period. Some 2D pictures show the results of this project, and they are presented at www.tibiscum.uvt.ro.

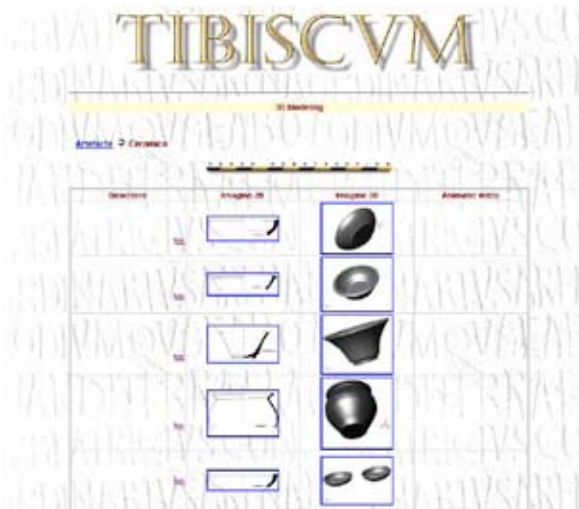The webpage will be continuously updated with other reconstructions and improvements.

Fig. 9. The 3D Modelling webpage of Tibiscum
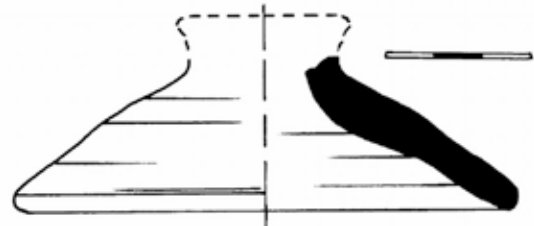

Fig. 10. Pottery Reconstruction)

Fig. 11. Pottery Scan for Reconstruction 1
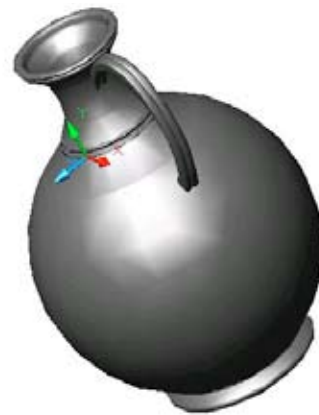

Fig. 12. Pottery Reconstruction 2

Fig. 13. Pottery Reconstruction 3

Fig. 14. Pottery Reconstruction 4

Fig. 15. Pottery Reconstruction 5

SWOT Analysis of the Brăila Museum Website – Romania

Camelia Hristian

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A lot has been argued on the Internet. In a very short time it has become part of our lives and we no longer figure out how we could make it without a connection to the virtual universe. Are we developing an addiction? Yes, we are! And that is because it has proven to be much more encompassing and useful than we ever imagined. It merges all the other media – direct communication, post, fax, books, written press, radio, and TV. The Internet has not replaced these media. It has made them stronger, subtler, provided them with a cheaper, more comfortable and quicker new support. The Internet developed a new virtual world, where reality and fiction intermingle due to a technology that provides us with a support which we should take for granted and use it to our advantage when it comes to communicating, informing, and entertaining.

The museums have found their place in this virtual world, in a slower rhythm than other domains. The economic factor might not be the main cause of that delay. As we see it, the specificity of the museum domain – the management of heritage items and the reluctance relating to publishing the results of the researches on a support where the copyright law is more difficult to apply – as well as people's outlook could be the reasons why the museums have put to good use few of the advantages of the Internet. The fear for virtual visits replacing actual visits to exhibitions, the controversy surrounding the delimitation between free cultural information and specialty information that has to be disseminated through scientific publications only still make many museums hesitate to develop their own websites or hesitate to publish on site more than primary insufficient information that was not updated or promoted.

We are going to present the Internet experience of the Brăila Museum, not as a success story, but simply as it is, because it could prove useful to the colleagues in the other museums.

In 1992 the Brăila Museum acquired the computer and the first printer. Thus it became one of the first museums in Romania to own such an endowment. Today we can say that all the specialists in the museum – with higher or high school education, have an Internet connected computer on their desks. We deal with a managerial policy meeting the current requirements. An Internet connected computer provides one with openness, access to information, the opportunity to document oneself, keep in touch with the colleagues wherever they might be and with other organizations.

Since August 2005 we have had our website. Until then primary data from the departments of the Brăila Museum had been published on Internet pages, but on the initiative of other organizations. It hardly meant an actual beginning, as we cannot talk about the real advantages of that period, when the data were schematic (addresses, telephone numbers, a short history of the Museum and a few data on the collections), and when we had no possibility of updating, and completing the data. All we could do was signal the fact that we existed.

We shall present, under the form of a SWOT[1] analysis, our true virtual experience, begun at the moment when we acquired our own endowment and developed our own website. We perform this analysis periodically to see what is not working as it should and what options lie ahead of us. It is an analysis we recommend to all our colleagues in museums.

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[1] "The SWOT analysis is a method of looking into a certain fact, at a given moment, based on a systematic study of four categories of contextual elements: strength, weakness, opportunities, and threats. The first two elements result from the analysis of the organizational milieu, while the other two from the analysis of the environment. The SWOT analysis is not confined to identifying the mentioned elements. It establishes their causes and formula*tes adequate recommendations. The main advantages of the SWOT analysis consist in: a. ensuring the grounding for current decisions, the strategies and policies of the cultural organization; b. favours a preventive approach to the issues that the institution faces". (Vasile Zecheru, Management în cultură* (*Cultural Management*), the Publishing House of the Centre for Cultural Training, Permanent Education and Management, Bucharest, 2001, pp. 124–125).

Strong Points	Weak points
RESOURCES	

RESOURCES

• Due to the Internet – e-mail and chat – **internal and external communication is very efficient and involves minimum costs**. The communications, the information received on the e-mail address of the museum as well as the information obtained from monitoring the mass media and cultural websites (by the public relations department personnel) promptly reach all the specialists. Each specialist can inform himself and can communicate to anyone who has an Internet connection.

• The Brăila Museum has its own domain "muzeulbrailei.ro"

• Our domain does not have the correct dimension. While at first 50 Mb seemed sufficient, as time passed and we updated the site, it became cleat that upgrading was necessary. A major shortcoming of our website, because of the size of the domain, is the fact that **we cannot use zoom for the photographs published on the site** because we must load small sized photographs. Under the circumstances, the details on the photographs are not visible, nor can they be downloaded from the site. Moreover, **we cannot load on the site but few sound files or video files**. Consequently, to upgrade the domain is our priority no. 1.

• http://www.muzeulbrailei.ro/ **exists and the data published are correct and updated**. We have found that it is important for the **person who is in charge with the upgrading to be an employee of the museum**, so that the upgrading and correction of any erroneous data should be performed on the spot.

• The specialist who carried out the site technically is an employee of the museum, but he has other main tasks, as he is an archaeologist, Ph.D. applicant. **During the summer** he happens to be away on the site and under such circumstances, **the upgrading cannot be performed on time**.

DATA. STRUCTURE. DESIGN

• We selected and structured the data published according to two key questions:
A. the **categories of target public**
B. the **purposes for which we develop this site**

• There are **shortcomings in the design**. Our web-master is already working at altering it, more exactly at developing an index including lists at each button, in order to 'clear up' the first page and other agglomerated pages.

A. PUBLIC:
Specialists:
– The Brăila Museum has six departments. For each one we set the data in order according to the same pattern: contact data, the photograph of the building, history, scientific activity, heritage,

Strong Points	Weak points
specialists, photographs in the basic exhibitions, photographs with special objects from collections. At the Archaeology Department, we added 'Scientific Sessions' and the 'List of the Archaeological Site with Participation of Our Archaeologists' under the form of a map	
– Also for the specialists we introduced the column 'Exhibitions Proposed For Itineraries' – a sequence of *.jpg obtained from exporting some presentations, in PowerPoint, of the exhibitions in question - which we can organize in other museums or cultural centres, in a formula we propose or an itinerary one, in collaboration with other museums in this country and abroad.	
– For the conservators and restorers we introduced the column 'Restoration'.	
– Also for the specialists we introduced the columns: 'Book Offer' with the 116 volumes published at the "Istros" Publishing House of the Brăila Museum (volume covers and primary data - author, title, number of pages, price) and 'Editorial News'.	• **Only some newly issued volumes have published presentations, and the periodical publications do not have the contents published**.
– The 'Cultural Events' column is addressed to the specialists, but also to other categories of public	
– For the foreign specialists the basic data are published also in the French and English languages.	• **The exhibition presentation texts more often than not are scarce**
	• **Not all the relevant columns are translated into the** French **and English languages**. It would be ideal for the translations to be employees of the museum as the site is updated very often. The **translators we collaborate with carry out the translations for us, in which case the translation costs are too high**.
Mass-media	
The 'Mass-media' column - here we place press releases, which we send to journalists from the databases and by e-mail.	
Pupils, Teachers	
The 'Pupils, Teachers' column comprises 'Competitions', 'Circles', 'Video Material', 'Education'.	
The 'Useful Links' column with educational links we recommend, 'Pleading for Partnership', 'Cultural Events'.	**This column** has to be much improved, as it has **scarce data**

Strong Points	**Weak points**

Ethnic Communities

The columns: 'Cultural Events', 'Pleading for Partnerships', and 'Financed Projects', 'Services', 'Partners - Sponsors', 'Contact'.

The 'Partners – Sponsors' column includes free presentation pages for ethnic communities. For the time being only the Greek Community page has been published.

Organizations

The columns: 'Cultural Events', 'Pleading for Partnerships', and 'Financed Projects', 'Services', 'Partners - Sponsors', 'Contact'.

Tourists

The 'map' of Brăila with the locations of the buildings

The presentations of the buildings, collections 'Cultural Events'

'Useful Links' - the links to the portal of the county, the tourist guide of Romania, the tourist sites in the English and French languages, the presentation sites for the history, traditions and important monuments in Romania.

For the foreign tourists the basic information has been published in the French and English languages.

B. USEFULNESS

The site is a public relations tool.

The **archive** containing important data on Brăila Museum and the past of Brăila.

– **a source of accurate information** for the Brăila Museum specialists. They can use them for carrying out reports, press files, analyses, etc.

– **a source of accurate information** for other specialists, the mass-media, the students, teachers, pupils, and tourists.

A promotion tool for collections, services, specialists, publications, the cultural events of the Brăila Museum, with concrete results:

– **a higher number of actual visitors** (in 2006, in comparison with the previous years). The website provides primary data and gives an incentive to visit the exhibitions.

– **the past of Brăila is much better known.** The website prepares the visit to the museum

Strong Points	**Weak points**

and completes the information obtained during the guiding or from the visual material in the exhibition halls.

– **the number of people who find out information on the Brăila Museum and the past of Brăila increased**. They are our virtual visitors. many of them have never visited the city of Brăila. The local or national information has practically become global. Geographical, linguistic and psychological barriers are surpassed. We have visitors from all the continents. See annex.

– **the number of partnerships and collaborations increased**. In 2006, the website provided us with a series of partnerships, initiated by various organizations - schools, high schools, associations, and museums that have found out about our activities by means of the site.

– **the number of publications sold by post increased**. The column 'Book Offer' serves as a virtual library window.

PROMOTION

• We promote the site through as many channels as possible and analyse almost daily the situation on the monitoring portal.
By **printed material**: posters, calling cards, personalized bags, articles in the press or various publications
By **subscribing on various search engines: Google, Yahoo**

• **By subscribing on various portals with high traffic:** www.cimec.ro, www.icom.museum, www.portal-braila.ro, www.braila.org, www.hoinari.ro, www.dl.ro, www.roportal.ro, www.fad.ro, www.best-top.ro, www.neogen.ro, www.statistici.ro, www.linkutil.ro

• **By exchanging links with other partner organizations**. For instance, www.bjbraila.ro, www.panoramax.ro

• By **email lists**: museums, personalities, mass-media, schools, high schools, universities, cultural institutions, tourist agencies, non-governmental organizations, the Diaspora, Brăila people, etc.

— Weak points column —

• Our site is not yet **sufficiently promoted**.

• Only **a few terms on the site are recognized on the search engines**. Priority no. 2 for us is to immediately subscribe as many terms as possible from the site on the search engines.

• There are **more cultural and tourist portals, with a good presentation and traffic, on which we have not yet subscribed**.

• **We have no virtual banner and we do not yet host a banner of another organization**

• We do not know yet whether our email sent to a school was read by a teacher or more or not, or if **the information has reached the pupils**

• **We do not know yet which columns on the site are accessed more often, we do not know the socio-demographic profile of our virtual**

Strong Points	**Weak points**

• **To monitor the traffic on the site, it is subscribed on traffic.ro**. That way we know how many visitors we have on the site daily, how they entered the site. For instance, up to now, 57.70% of our virtual visitors on the site entered directly, 21.11% by web references, 20.66% by using search engines and only 0.54% by email references. These are data we survey on a daily basis.

visitors, we do not know if some of them got on the site by chance, whether they have actually read anything on the site or not, if they have found the information they were looking for, whether they copied anything from the site or not, we do not know for how long they have stayed on the site.

DEVELOPING CONCEPTS

In order to actually attain the goals we bear in mind, we keep on analysing the possibilities of developing the site, of increasing the traffic and render our virtual visitors faithful by introducing new columns and by improving promotion techniques.

The potential of a website is truly huge. Besides the obvious role of public relations tool, the **website can bring new ways of expression for a museum, can redefine the role of the museum**. It may contribute to:

Developing the educational role of the museum, according to the 'distant learning' principle for pupils and for adults as well.

We are already thinking of **introducing a monthly or bimonthly virtual journal**. We have not yet decided upon the format, nevertheless we have begun to think about what it should contain: articles on the 'invisible' activity of the museum in each specific field, stories about the personalities of yore in the city, about the past life of the city, stories about the exhibition artifacts and about the artifacts that for conservation reasons or lack of space cannot be displayed, articles about donors, articles that might support the curriculum. On the inquests developed in time we understand that, for many people, the museum is the same with the permanent exhibition and the activity of the museum is the same with the opening day and few know what a real museum means. The journal has to appeal not to the specialist, but to common people, pupils. Hence the relevant terms need not be there or at least they should be explained. This journal will play both an educational role and

WHAT WE SHOULD AVOID

The major risk in the case of a website is consuming resources, and developing it, but having almost no visitors. In the early stages of a site it is a normal situation. It is grave only when that situation lasts for several months. It is a serious promotion shortcoming.

The second major risk for the site is not to be visited any more after a period of a few months of normal traffic. It is simply a matter of losing interest in the information published there. It is also a normal situation if it is not updated and if new useful information is not added all the time. We should think about the short duration of a newspaper or review.

The third major risk consists in the technical construction of the site - it is important to be accessed in due time, because the potential visitor can get bored in case the transfer from the server to the browser last for more than a few seconds. It is equally annoying if the page format exceeds the limits of the screen width (it happened also to us during the first month of existence). Grammar and style is an issue of credibility. We should regard the site as a publication and a means of promoting the institution in the virtual world.

It is important to specify in the subscription title on the portals 'Official Site of the Museum X'. On the Internet data on the institution can certainly be viewed also on other sites. On the Brăila Museum we have found many data that are not accurate or updated. Not all the users have enough selection criteria. We should observe also on the Internet the media principle - checking three sources - but not everybody takes that

Strong Points	Weak points

one of drawing in virtual visitors and a role of increasing the traffic on the site.

As Brăila has been an ethnic mosaic - here have lived next to Romanians: Greeks, Turks, Jews, Bulgarians, gypsies - we shall continue to promote on the site the culture of the Brăila minorities, as belonging to the culture of the city. During the first stage we proposed to host for free on the site the pages of the Brăila ethnic communities. We have already published on the site the page of the Brăila Greek Community, we shall soon publish the page of the Bulgarian Community, and we have already talked with the presidents of the Brăila ethnic communities to complete this cultural perspective of the city. Traditions, meaningful days, gastronomy, aspects from one's own events will be found in these pages. In the future, we wish to publish these pages also in the languages of the minorities in question and to subscribe the more important terms, in the languages in question, in the search engines. In the virtual journal a page will be reserved for the ethnic communities: articles on their past, museum artefacts evoking their culture, personalities, and monuments of their heritage.

Developing the economic role of the museum by promoting the tourist heritage - architectural, historic monuments, natural attractions. We hope to arouse the interest of the tourist operators, to make them work out also other tourist circuits and thus, to contribute to **developing tourism in the region, especially cultural tourism**.

Developing the social role of the museum. A future column will be a talk list, on which we will periodically propose topics relevant for the community.

New promotion ideas:
– posters in each education institution and in the locations of the tourist operators in the city
– publicity in the local mass media and in school and high school publications
– We cannot afford to pay for advertising, therefore we shall initiate competitions in the local press and in radios (questions with answers to be found in the texts published on the site). The winners are going to be awarded prizes consisting in publications edited at our publishing house.

into account. The information can be used for educational purposes and if the users do not know how to search and choose the information there is the danger for the information to be taken from other sources. Let us remember that on the Internet anyone can write about anything.

Another issue to be taken into account is the **information on any site can be easily transferred, taken over**. It can be taken over even without specifying the source or can be interpreted incompletely or erroneously. Thus, **one should delimit the copyright information that can be published on the Internet protected by a password that will allow only the users who know the password to access or the users who pay for that information**.

Strong Points	Weak points
– subscribing the site on other portals and sites with high traffic – two new columns: 'Inquiry' and 'Impression Book' to have more analysis and assessment elements – developing new email lists – Promoting the site also in rural areas, wherever there is Internet connection. After upgrading the domain, we shall introduce atmosphere elements: for instance, short recordings with Brăila personalities, folk craftsmen, perhaps recordings with old music on sound rendering devices in the History Department collections, bird and animal sounds, little films from archaeological sites or special events. Apparently the opportunities are limitless, but we shall analyse the technical limits, more precisely we shall see that the transfer speed from the server to the browser should not exceed the normal limits.	

Opportunities	Risks
• **Integrating Romania into the European Union** entailed a higher interest in Romania. It is important to promote our collections and specialists by means of the website and to communicate by the Internet with specialists from other countries, as the accession provides us with partnership opportunities, cultural exchanges and an easier circulation of specialists in Europe	
• **Opportunities of investing in endowments by accessing European funds**. There are museums that due to a European project succeeded in installing the Tom Touch systems connected to the Internet in museums and in other public places. These systems contribute to promoting the museum institution in the community, but they are also a good educational asset	• **Limiting the state subsidy, the insufficient or 'syncope' finance.** It does not allow a strategic planning, and, in most cases, accessing European funds (the lack of the own participation sum necessary for being eligible in the project). • The poor accessing of community programs from **lack of trained personnel able to write and manage projects**.
• **Developing the economy of the county**, drawing in foreign investors. The location of the Brăila Museum in Brăila – a port city providing opportunities for developing shipping and trade. The free area of Brăila might influence the economic evolution of the county, and, implicitly, entail a higher purchasing power. Fulfilling the physiological needs (the Maslow pyramid) entails other needs in the population – including cultural ones. The economic growth can influence also the education system, the endowments – including more computers connected to the Internet.	• The location of the Brăila Museum in **Brăila – a city with a modest economic development, a low purchasing power of the inhabitants, a high unemployment rate, and a strong trend in people with higher education to migrate to the capital and to the West**.

Opportunities	Risks
• **Developing the infrastructure and developing tourism** in general and local tourism (circulation, rest, scientific, cultural, agricultural tourism). **Tourists require information** and access tourist and cultural sites. At Brăila there are many tourism development opportunities:	

• **Developing the infrastructure and developing tourism** in general and local tourism (circulation, rest, scientific, cultural, agricultural tourism). **Tourists require information** and access tourist and cultural sites.

At Brăila there are many tourism development opportunities:

– **Rehabilitating the historical centre of the city of Brăila and Brăila port** due to the 2004 – 2006 Phare project. Economic and social cohesion. Component – Big regional infrastructure projects. **The project includes consolidation – restoration for: Brăila Museum premises – wings B and C, 'Nicăpetre' Cultural Centre, 'Panait Istrati' Memorial House, the building of the Ethnographic Department in the Public Garden**.
– **Planning the Brăila Cliff, the Danube beaches, introducing ships and boats.** Brăila is already included in the **cruises program on the Danube**.
– **Other possible tourism development opportunities** at Brăila:
– Planning Lacu Sărat resort and Măxineni Monastery
– Developing the hotel network and the food services
– **Building up the underground caves in the former Brăila Fortress** and promoting them
– Planning a Botanic Garden and an Aquarium at Brăila in the Monument Park
– **Building up an Astronomic Observatory** in the Water Tower in the Public Garden
– **Creating special events:** craftsmen's fairs, minorities' festivals, events reminding that Brăila is an ethnic mosaic, a strong port and cultural centre before World War I, a Festival of the former Turkish Brăila district or a Fishermen's Festival
– **The Brăila Greek Community** – strong. The museum has a valuable Greek objects heritage. Hence the opportunity of joint projects with Greek organizations.
– **'Panait Istrati' Memorial House** under the management of the Brăila Museum. Panait Istrati lived in France and travelled to many countries. Hence the opportunity of joint projects with cultural organizations in France (Panait Istrati's father was Greek) and the East (depicted in Istrati's books)
– **Organizing international scientific sessions at Brăila** might promote the city on the Danube abroad

• The location in **Brăila – a city with an average tourist infrastructure, a city located outside the European transit corridors and at a long distance from the EU member states**.
• Brăila has turned into an almost 'dead' city, the **port is not at all valorised** like in the European cities favoured by their position on the river.
• **'Lacu Sărat' resort does not draw in pensioners**, because of the lack of decent tourist conditions: cleanliness, restaurants at tourist standards, entertainment units for spending spare time
• **Weakly promoted tourist zone**: no high quality promotion materials have been achieved – post cards, folders, catalogues, video materials, high quality tourist site.

Opportunities	Risks
• **The national campaign for changing the image of the museum institution, for rising the cultural level of the population, including the willingness to visit a museum and to navigate on the site of a museum** (Involving certain non-governmental organizations, public relations and publicity agencies, national mass media institutions and the Internet – taking into account the young people's preference for getting information on the Internet). • **Developing public relations services in public institutions and other cultural and tourist organizations at Brăila. Developing attractive portals for the city, county, developing attractive tourist sites** might influence for the better also the traffic on the site of the Brăila Museum and the number of visitors to the Brăila Museum.	• The **weak development of the local mass media and the civil society** at Brăila. • The **difficulty to change the perception, the image of the museum institution on a national level**. Unfortunately, statistics show that a very high percentage of Romanians have never visited a museum. Statistics show the preference for other cultural and entertaining activities, a taste for violence, eccentricity and the commercial • **The lack of concern of the public administration for promoting the heritage of the city, the lack of a local and regional strategy of promoting tourism and culture**.

Visit http://www.muzeulbrailei.ro/ and return to http://www.muzeulbrailei.ro/!!!

Annex

Domain	Country	Percentage	Graphic
.ro	Romania	73.5%	
.net	Network	7.86%	
.com	Commercial	6.78%	
.md	Moldova	1.80%	
.de	Germany	1.52%	
.ca	Canada	1.44%	
.it	Italy	0.94%	
.fr	France	0.79%	
.pl	Poland	0.65%	
.uk	United Kingdom of Great Britain	0.51%	
.arpa	Arpanet	0.51%	
.es	Spain	0.43%	
.bg	Bulgaria	0.36%	
.il	Israel	0.36%	
.ae	United Arab Emirates	0.36%	
.be	Belgium	0.29%	
.hu	Hungary	0.22%	
.edu	Education	0.22%	
.ch	Switzerland	0.22%	
.nl	Holland	0.22%	
.tr	Turkey	0.14%	
.Org	Organizations	0.14%	
.au	Australia	0.14%	
.ar	Argentina	0.14%	
.info	Info	0.07%	
.lu	Luxembourg	0.07%	
.se	Sweden	0.07%	
.tv	Tuvalu	0.07%	
.cz	Czech Republic	0.07%	
.gr	Greece	0.07%	

The Website of the Romanian National History Museum

Dana Iacovache – Eugen Paraschiv

National History Museum of Romania, dana@mnir.ro

The explosive development of the Internet and the appearance of the Web in 1989 have offered an unlimited treasure of information and resources to millions of interested people around the world. The wish to make ourselves known and easy to find, to offer information about our museum or about the collections we possess, has made us initiate the first Web page of our institution in 1999. The beginnings were shy, but this has lent us the possibility to learn how to present ourselves, how to become part of this huge international web of information. As the time passed, the mere updating of this first presentation was not sufficient any longer. We felt the growing need for the existence of a more dynamic page, which should offer more information to interested parties, which should ensure permanent communication with the on-line visitors of the museum. Thus, hand in hand with reorganising the museum and the main exhibition, we have embarked upon the construction of a new site, which should answer to the new aesthetic demands and at the same time face the competition in this field. The new site is meant to give as clear an image as possible about our institution, its role within the Romanian and international cultural and scientific landscape to the history-loving public, and not only. Moreover, it is an attempt at opening new horizons for the large history-loving public towards our field of research and at familiarising it with our work.

Now, the site of the Romanian National History Museum addresses both the large public, offering information of general interest on the museum and its collections, and scientific communities, by displaying on-line the publications and research work of the specialists who work here. In order to reach this aim we have envisaged a dynamic and modern site, which should offer useful and exact information to the visitor, without neglecting its scientific character.

The site of our museum displays a menu on the title-page which enables the on-line visitor to access very easily the sub-pages he is interested in, so that it only takes one click on the mouse button to rapidly enter the wondrous world of the Romanian National History Museum, a realm pervaded with history and art (*Fig. 1*).
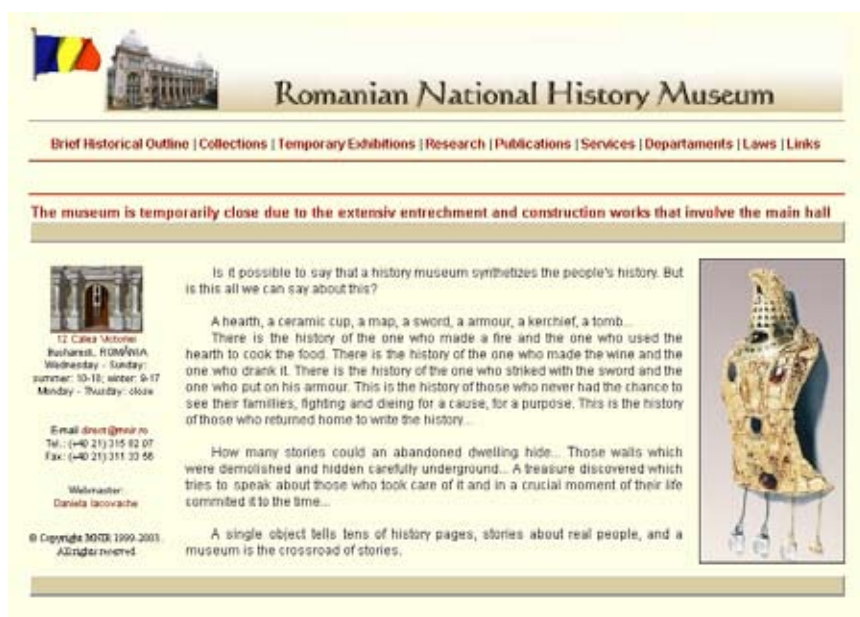

Fig. 1.

Like any prestigious institution which strives to be known as widely as possible, we have deemed it necessary to introduce a prelude to our interpretation, namely a short historical account of the site on which the building of the museum was erected, along with several architectural details, stressing the fact that its antiquity and the functions it has held across the ages has led to its being considered a historical monument in itself. Taking into account the fact that it is situated in the historical centre of the capital, a zone filled with significance for the visitor who is interested in architectural art and in the struggled history of Bucharest, we display an on-line map of these, with their most important and representative buildings. The map is meant as a guide for our visitors, facilitating their access to our museum. Along with the short historical survey of the museum's location we have considered it necessary to make a presentation of the past of the museum, from its creation until today. Thereby we wish to show our public the strong bond between the site where the museum is placed, its history and its sphere of interest.

As we wish to be as close as possible to our visiting public and to come forward and encourage those who are interested in visiting us, we welcome the release of information regarding the program of the museum, as well as telephone numbers and e-mail addresses where visitors can make reservations for guiding tours or confirm organised groups. All this information is presented on the first page of the site for a rapid and correct briefing of the large public.

In the menu there is a chapter called '**Collections**', which presents the public with the whole list of collections in our museum according to historical ages, starting with prehistory and ending with the contemporary period. One click only and we can undertake a trip across Romania's history, from its most ancient times until the present day, in a matter of minutes, so that our visitor can see what the most valuable and representative items of our museum are. Special attention is lent to the presentation of the *Lapidarium*, which displays a copy of Trajan's Column, whose original can be seen in Rome. This asset we have tried to reveal to our public in a novel graphic form, as dynamic and attractive as possible, as we wish to enable those who are interested in knowing more about this part of our history to use our site as a working tool. It is the first time when all the *metopes* in the column are presented on a site, with individual comments, so that they might be easily accessible to both specialists and students eager to get acquainted with the column (*Fig 2, 3*).

Several items have been selected out of the *Lapidarium*, according to their relevance to the categories of monuments on display here. Thus, we have included civilian monuments (documents, decrees, honorary monuments), religious ones (funeral and votive monuments), sculpture, as well as decorative and architectural elements (*Fig. 4*).

Due to the fact that the museum's permanents exhibitions are being rethought and reorganised, we have so far only presented those sections that have kept being functional.
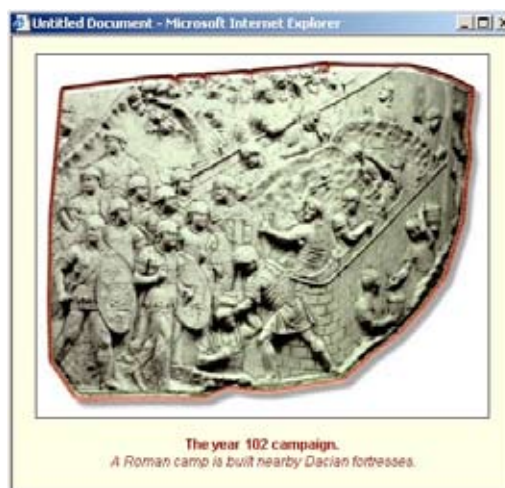

Fig. 2.

Fig. 3.

The on-line presentation of the patrimony in the treasury is being reformulated, as we intend to lend it more dynamism and at the same time to give as much information as possible about the items on display here.

Besides the permanent exhibitions, the museum also constantly hosts temporary exhibitions which are illustrated on the museum site under the heading **'Temporary Exhibitions'**. These exhibitions blend history and art. Temporary exhibitions organised by the specialists of the museum in collaboration with specialists from other museums of cultural institutions are an important incentive source of interest in visiting the museum for the large public or for a certain targeted public. Our site offers useful details regarding the temporary exhibitions such as

Fig. 4.

information concerning the dates and venues of the openings, information regarding their organisers, and also some information on the objects on display in each exhibition. Special attention has been lent to the creation of a folder which should contain an archive of all temporary exhibitions that our museum has organised over the past three years.

Another important chapter of our site is the **Research** page, which strives to bring information about the programmes and the projects that are being carried on at the moment. It has two subchapters entitled '**The Main Archaeological Digging Sites**' and '**Programmes and Projects**'. This is where our site presents the museum's main directions of scientific research, classified according to the various fields of activity: archaeology, history, other projects (art, culture, social interest). The chapter on research is periodically completed in order to provide the large public with a comprehensive view of scientific research in Romania. Two such national program are *Alburnus Maior* and *Autostrada Braşov – Borş* (the Braşov – Borş Highway). They are based upon the research of the team of archaeologists within the preventive archaeology section. This is where we also introduce the project on *Pluridisciplinary Archaeological Research in Romania*, conceived within the CERES program, striving to cover all the great fields of pluridisciplinary research and at the same time to provide interested specialists here and abroad with a most thorough bibliography on the papers written on these topics. This page has so far only been edited in Romanian, but the English translation is to be inaugurated as soon as possible.

Besides the chapter on research there is another chapter dedicated to publications that have been issued under the care of our museum. Here we present both periodical journals published under the direct coordination of the museum staff and various publications and books to which members of the museum staff have made their contribution. Through the periodical publications, as well as through the books published under the care of the Romanian National History Museum, we intend to give a better account of its collections and directions of research to the large public, as well as to the specialised public.

The '**Services**' chapter is very well structured so as to include information which is necessary to any history lover who might like to visit our museum. Thus, this chapter offers up-to-date information on the costs of all services and offers provided by our museum, from the ticket price to the costs of some souvenirs and mementos (pictures, films, CDs, etc.)

For whom it may concern, we have a chapter called '**Departments**', which contains the list of names of the whole staff according to sections, open for consultation to those who would like to get acquainted with the leading board or even the large team of the museum.

The chapter '**Legislation**' presents the main normative acts and decisions according to which the Romanian National History Museum can function. This chapter even provides the interested public with references to legislation or with links with similar pages. This chapter, along with the one on

'**Departments**', offers information on the internal organisation of our institution, its department and staff.

The last chapter is devoted to links with direct references to similar institutions in our country and abroad. This chapter is structured according to different domains (museography, archaeology, history, tourism, IT, *varia*) in order to provide the users of our site with rapid and useful information.

Hoping that this presentation will enhance your interest, we invite you to access our site as freely as possible, thus getting acquainted with one of the most prestigious cultural and scientific institutions in Romania. But as the pleasure of walking among objects of venerable age cannot be equalled by a short trip to our site, we wait for you to pass our threshold and enter a wondrous realm in which history intertwines with art and where human creation comes to complete the divine one. May this journey into our past, across our exhibition halls, bring you closer to our creed and activity?

The 'History of Brick in Finland' and the 'Finnish Museums Online' – Internet Projects of the National Board of Antiquities

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The basic principle of the Finnish National Board of Antiquities is to study and preserve different aspects of Finnish cultural heritage and make this information available to the public. Two projects promoting this principle are presented in this paper. The 'Tiilen historiaa Suomessa' (History of Brick in Finland) web site offers an extensive presentation on the tradition of brick use in Finnish building, while Finnish Museums Online is an example of how cultural heritage in the form of museum collections can be published via the semantic web.

1. Finnish Brick Building Tradition On the Web

1.1. Brick in Finland – History

Foreign artisans brought the tradition of brick masonry and brick manufacture to Finland in the 13th century A.D. most probably from Sweden or the Baltic countries. At first, brick was used only in defensive or ecclesiastic buildings, such as castles, churches and monasteries. Communities were in charge of brick manufacture, with the Church being the leading brick producer. No private brick works existed and thus brick manufacture did not really have a commercial role (Kuokkanen – Leiponen 1981).

In the 16th century, the state became the leading producer of bricks due to increasing fortifications and decreasing church building because of the Reformation. The 17th century witnessed a decline in state supported brick production. However, private brick works emerged and brick production became more commercial. The use of brick in private residential buildings became common in towns. Extensive fortifications along the coast had a great influence on brick production in the middle of the 18th century, as the state acquired most of the bricks from private brick works (Kuokkanen – Leiponen 1981).

The Industrial Revolution of the 19th century proved to be a turning point for the Finnish brick industry. For centuries, bricks had been manufactured only by hand, but now machines were introduced and railways offered a new way of transportation. The first ring furnace in Finland was built in 1870. The brick industry began to develop rapidly at the beginning of the 20th century, and continues to grow after a slow period during the II World War (Kuokkanen – Leiponen 1981).

1.2. The 'Tiilen historiaa Suomessa' Web Site

Although several books have been written about the Finnish brick industry, no publication covers the whole tradition of brick use in Finland. This is the void that the 'Tiilen historiaa Suomessa' – website (History of Brick in Finland) aims to fill. One goal has been to present the subject in a simple, easily understandable way, but still bring forth the richness of shapes and architectural or constructional uses. Hopefully the site will serve not only professionals, but also people with little or no prior knowledge of the subject, including students and the public. The project of building this internet site began in 2001 and went on periodically until the final version was released in December 2004.

The site is based on a collection of bricks in the National Board of Antiquities (NBA), Department of Monuments and Sites. The collection consists of 554 bricks and 99 roof tiles, and covers a timescale extending from the middle Ages until today. The bricks have been gathered from restoration, construction and archaeological sites from the beginning of the 20th century onwards.

On the site, the brick material is complimented by basic information on the history of brick usage from both a constructional and an architectural point of view, on the manufacture of bricks and the history of the Finnish brick industry. The site offers a photograph gallery of different brick shapes included in the collection, a glossary, a list of further reading and a list of links to other relevant websites.

Considering the wide variety of people expected to visit the site, the site should be visible also in older browsers. Thus the technical side was kept quite simple. The site was built with Macromedia Dreamweaver MX using basic dynamic HTML code: HTML code with CSS style sheets and JavaScript. The code was also modified by hand when necessary. Adobe Photoshop 6 was used for designing the layout of the site and editing the images.

The 'Tiilen historiaa Suomessa' –site has been released only in Finnish. It can be found under the web pages of the National Board of Antiquities (http://www.nba.fi/tiili).

2. Finnish Museums Online

Finnish Museums Online (SMOL, http://www.suomenmuseotonline.fi) is a semantic web portal designed to bring together the digitized collections of Finnish museums. A Finnish IT services company, TietoEnator, built it for the National Board of Antiquities. The portal makes it possible for citizens, museum professionals and researchers to search the collections of several museums simultaneously instead of having to go through the museum web sites separately (ALKULA 2004: 163.).

There are several museum collection management systems used in different museums in Finland. In addition, organizations use different vocabularies and may use similar terms in different meanings. This problem has been solved in the Finnish Museum Online system by adapting a method of unifying vocabulary by creating core concepts, which act as a bridge between various data models, to metadata concepts from different collection management systems. Dublin Core Culture & Simple was used as a base for a schema, which on its part was used as a reference when searchable elements were defined. This system enables coherent searches as well as a uniform presentation of basic features, while each museum is still able to present the varying properties of its objects (ALKULA 2004: 166–167).

The Finnish Museums Online system is mostly based on three products: Profium Semantic Information Router (SIR, a semantic content [RDF] management platform), Apache Tomcat (java engine) and Microsoft SQL Server database. Data interface or output modules, programmed for each collection management system, are essential for the success of the transformation process. The modules, in which mapping (with the core concepts) and transformation rules have been programmed, search and collect metadata from the collection management system. After making transformations between the value domains, they attach specific XML tags around the data. This process is automatic, which means that museum personnel only have to know whether or not they want a specific piece of information published (ALKULA 2004: 167, 170.).

The aim has been to create a system, which allows new data to be added easily with minimum modifications when new museums join in. The museums keep using their own, familiar collection management systems from which data is sent to the SMOL and published. This means that only one system needs to be maintained and in case of a breakdown in the portal system, the original data is still safe and can be reproduced from the collection management system (ALKULA 2004: 168–169.).

At the moment, output modules have been created only for two major collection management systems, Musketti and Siiri. In the future, the amount of data in the system can be increased by collecting more data elements from these systems and by creating output modules for other collection management systems as well (ALKULA 2004: 167–169.).

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Church 'Sveti Stefan' in Nessebar, Bulgaria, a Project for a Website

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Introduction

During the last decades there is an evolution of the concept regarding the scope and the role of cultural heritage from the perspective of the information society. Heritage is no longer considered only as a message from the past addressing the local community, but as an integrated legacy of mankind, which should be an object of common concern. The advanced understanding of its nature explains the tendency for inclusion of more types of monuments and wider areas into the framework of cultural heritage: from a single monument and its site (the Venice Charter, 1964) through historical towns up to the cultural landscapes and even cultural itineraries. Evidently heritage preservation and usage has an over-national, even inter-continental scope. This reflects the tendency to form a global conservation strategy and to appreciate the surrounding environment as an integral value.

The image of the new structure of cultural heritage on our planet gradually develops: instead of the present disconnected and autonomic local systems – a coherent world macro-structure, reflecting the richness and unity of the universal culture of mankind is an alternative . This macro-structure can be further considered as a resource for economic development, which should be utilized. And how if not by using the biggest utility of the XX century – the internet, the worldwide web.

The objective of this paper is to reveal how a local heritage site is going to turn into a web site and join the virtual macro-structure of world heritage.

Relevant Background

It all started from a course project in the discipline 'Restoration' at the University of Architecture in Sofia, Bulgaria. The theme was 'Preservation and presentation of the church 'St. Stefan' in Nessebar. The old part of the town of Nessebar is a UNESCO site.

Our task was to make a survey of the conservation problems of the church and to suggest a way for integration of the site in the present life of Nessebar. As we went deeper into our research about the cultural potential of the area and the church itself, regarding its cultural value and importance, we became confident it deserves proper web promotion. This is how a term student project in the field of architecture turned into an idea for a web site and also the subject of this paper.

The first part of the paper briefly describes the church itself – its location, specific features, values and problems as we saw them while working on the architectural project.

The second part presents the thoughts and questions we had while transforming ourselves from authors of an architectural project into future authors of a web site.

The Church's

Location (Figure 1–2.)

Situated on a rocky peninsula on the Black Sea, the more than 3,000-year-old site of Nessebar was originally a Thracian settlement called Mesambria. At the beginning of the 6th century B.C., the site

became a Greek colony. The city's remains, which date mostly from the Hellenistic period, include an acropolis, a temple of Apollo, an agora and a wall, which was a part of the Thracian fortifications. Among other monuments, the Stara Mitropolia Basilica (*Figure 3, 4*) and the fortress date back to the early Middle Ages. During that time the city was one of the most important Byzantine settlements on the west coast of Black Sea. The wooden houses from the 19th century are typical for the regional architecture of the period (*Figure 5*). In 1956 the town was proclaimed an architectural and archaeological reserve. The remnants of an antique fortified wall with a gate dating from III–IV century, the churches from V–VI century and the ones dating from the medieval period (X–XIV century), which are fine works of the medieval Bulgarian and Byzantine architecture, the 60 houses of the revival period, give the town a unique appearance and atmosphere.

In 1983 the reserve was inscribed in UNESCO's list.

Description

The church is a typical representative of the medieval basilica structure, combining the high quality of architecture, construction methods, frescos and wood- carving. The monument is an example of a unique synthesis of all types of arts, which is a result of layering of several periods of construction and decoration. The image is authentic, based in terms of materials and design. The church exposes some of the oldest frescos in the city, created by representatives of three art schools, among which is the Cretan one. *(Figure 6, 7, 8)*. Also here is one of the oldest wooden iconostasis on the Balkans *(Figure 9)*. The

Fig. 1. Location of Bulgaria, Nessebar and church 'Sveti Stefan' on the map of Europe

Fig. 2. Panoramic view of the peninsula

Fig. 3. View from Nessebar – Stara Mitropolia Basilica

typical for all churches in Nessebar mixed masonry of stone and brick (a Roman influence) is present here *(Figure 10)* as well as the Lombardian arches *(Figure 11)* which are also evidence of the influence of West European architecture. As part of the cultural, historical and architectural ensemble of Nessebar the church has a close relation to all the other monuments in the old town – a site, full of monuments of different periods of Bulgarian cultural heritage.

Stages of Construction and Decoration

XII century
XVI – XVII century
XIX century
    (*Figure 12*)

    VALUE
  Criteria:
    1. High cultural and historical value due to the unique synthesis of arts
    2. Belonging to an archetype
    3. Authenticity of concept, materials and structure
    4. Uniqueness
    5. Information about local and outer influences
    6. Relation to other sites of cultural heritage in Nessebar

Current Problems

Conservational and restoration problems:
• frescos – partially lost, currently in bad condition *(Figure13)*
• deteriorated plaster on the walls *(Figure 14, 15)*
• many openings with bad or no insulation *(Figure 16)*

Environmental problems– The main thread comes from the fact that Nessebar is becoming more and more attractive summer destination for tourists, their number increases each year and the peninsula, linked with the shore only by a narrow passage cannot get any bigger. The tourist invasion is higher than the cultural environment of Nessebar can sustain.

Funding

The World Monument Fund in close co-operation with 'A.G. Leventis' Foundation are currently supporting the church restoration, as well as three other conservation projects in Bulgaria. The foundation was another reason to start thinking about a web-site which could turn into a web-page of the foundation – regarding its activities all over the world, and thus presenting and promoting more cultural sites on the worldwide web.

The Web Site

Questions we need to answer:
• Which is the target group?
  ◦ students?
  ◦ specialists? – architects, archaeologists, historians, ethnologists, restorers
  ◦ others?

*Fig. 4. View from Nessebar –
Stara Mitropolia Basilica, surroundings*

Fig. 5. View of the XIX century part

Fig. 6. Frescoes

Fig. 7. Frescoes

Fig. 8. Frescoes

*Fig. 9. View of the wooden iconostasis
and the stone altar table behind it*

Fig. 10. Mixed masonry 'opus mixtum'
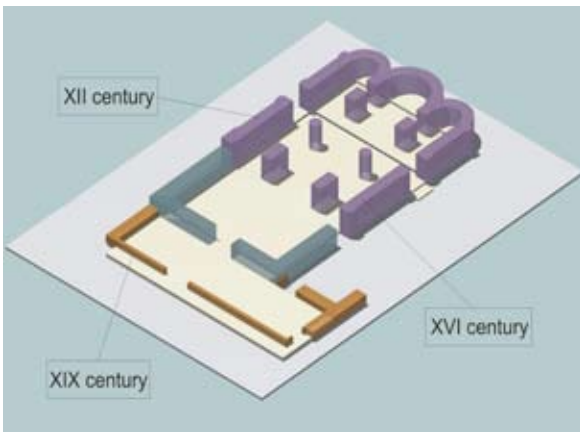

Fig. 11. Lombardian arches

*Fig. 12. Digital model of 'St. Stephen'
displaying stages of construction*

Fig. 13. Current problems – frescoes

Fig. 14. Current problems – walls

Fig. 15. Current problems – walls

- What is the optimal informative content of the site?
- How to make it interesting?
- Static or dynamic pages?
- Portals and search-engines to link to?
- Managing of the site?

 The project is still open

At the time when we were crossing the line between the architectural and the web site projects we received the opportunity to take part in the course 'Museum and the internet' in Bușteni, Romania. The course helped us a lot as it answered a lot of the questions we had and posed new interesting ones, which we still need to answer.

   We would like to thank all the participants for the active discussions and the organizers for making it possible these discussions to take place.

Fig. 16. Current problems – openings

Emerging Digital Image Formats
for Virtual Museums on the Internet

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1. Introduction[1]

More and more cultural institutions, such as museums make use of the World Wide Web and put their collections online (Museums in the USA). Besides the fact that the Web is very popular (especially among young people), it provides a great opportunity to museums preserve their data, to disseminate their information and reach people that live to remote areas, or have physical disabilities (Liarokapis *et al.* 2004). The museums usually have extensive collections and they can display to the public only some of their exhibits, either because they do not have enough space to exhibit, or because some of them are very fragile and can be damaged. In addition to this, exhibitions can cost a lot, so it is virtually impossible to make all of the cultural objects available to the wide public.

2. Virtual museum information

Firstly the information for virtual exhibits from available texts, manuscripts, drawings, photographs must be carefully collected. Then metadata, which mean data about the data, must be also documented taking into account initiatives and existing standards, like the Consortium for the Computer Interchange of Museum Information (CIMI), the International Committee for Documentation (CIDOC) and the Dublin Core Metadata Initiative (Dublin Core Metadata Initiative, ISO 15386).

Then the data about the virtual museum exhibits must be digitized. Apart from texts the information is available to the wide public through images. Images of virtual museum exhibits need to be detailed enough, so as to provide as much information as possible (Sylaiou *et al.* 2004). The level of detail is strongly connected with the resolution of the digital images.

3. Description of the problem

The images of a virtual museum exhibition must have high resolution, in order to offer a detailed view of the exhibit. It should be noted that most of the times, virtual museums mostly use conventional digital image formats for their web-pages that in the case of high-resolution images produce very large files. These heavy files are difficult to be transferred over networks, mainly because of the limits that exist on bandwidth availability that results in slow Internet connections.

There is always the option to decrease the image size by compressing the images[2]. Digital images contain large amount of unnecessary information and compression reduces their size, by eliminating these redundancies and discarding the non-essential information. Though, it must be taken into account that the images that use compression, in order to reduce their size, decrease also their quality.

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[2] Image compression is meant the procedure in which the data that are used for describing an image can be reduced (e.g. a compression of seven to one (7:1) means that the size of the compressed image is seven times smaller than the size of the original image, so as seven compressed images can be transported at the same time that would be required for one uncompressed image).

4. Conventional image formats

There are three main categories of conventional file formats that can be used for virtual museum web pages.

1. Digital images that do not use compression. In this category the most widely available format is TIFF, which stands for Tag Image Format. It is an open standard, it can provide images of virtual museum exhibits of high resolution and quality and it has a good zooming tolerance. Its main disadvantage is that it produces large files (Sylaiou *et al.* 2004).
2. Digital images that use image compression that can be further divided to:
a. Digital images that use l*ossless* image compression that preserve the data of the original image. GIF (Graphic Image Format) format has very small size, but it has a limitation of 256-color depth and it has poor quality. PNG (Portable Network Graphics) format is good for the Internet, but is has limited colour support and is not supported by all browsers.
b. Digital images that use *lossy* image compression. In this case the image cannot have a very high quality. JPEG (Joint Photographic Experts Group) format is an open standard and it provides an acceptable quality. Is has a small size and it can be compressed in various ratios. However, it has poor zooming tolerance[3].

Different strategies were required and new imaging technologies have been rapidly developed, so as to meet the needs for speed delivery and quality of images.

5. Emerging image formats

In order to address the existing limitations and problems, new image formats have been created. Their efforts have been addressed to the design of the new digital image formats that will allow the quick delivery of high-resolution images. The new '*Russian doll*' imaging architecture gives the opportunity of scalability and interactivity to the user, because multiple resolutions of an image are stored in a single file and give the chance to progressively transmit an image. Zooming and panning of the image are allowed. *FlashPix* and *JPEG2000* are the two image formats that introduced a new concept for imaging architecture.
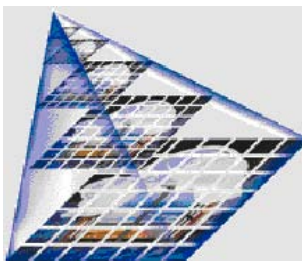
5.1. *FlashPix* format

*Fig. 1. FlashPix architecture
(Courtesy of LivePicture)*

FlashPix has been developed by Digital Imaging Group[4] in collaboration with Live Picture Inc. It can be described as a pyramid. To its base there is the full image resolution and to its top the lowest resolution one. A series of sub-resolutions fall in between. The files are stored at multiple independent resolutions, and each of them is subdivided into square tiles (*Figure 1*).

These features allow the user to make an area selection specified by a rectangle of interest and to zoom in. The original *FlashPix* file is larger than TIFF and BMP, but only one file is needed instead of four or more versions of the same image. Each layer is at one-quarter of the previous layer and is divided to tiles of 64 by 64 pixels.

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[3] This is not a problem, if the images are only for demonstration purposes to virtual visitors, but it is a major problem if a student or an expert wants to have a detailed image for thorough observation for research purposes (ICOM/CIDOC, 1996:22, Daniels 2000).

[4] Digital Imaging Group includes Adobe, Canon, Eastman Kodak Company, Hewlett Packard (HP) Company, IBM, Intel and Microsoft Corporation.

Two of the most known programs that can handle *FlashPix* images are the Adobe Photoshop and the Corel PhotoPaint. However, special free plug-in software should be downloaded from the Internet. In order to see *FlashPix* images using a browser, an additionally java applet should be used. Fortunately, this applet is usually downloaded automatically from the server that serves the images. *LashPix* is used to deliver very large, high-resolution images. This image format can handle high-quality pictures by providing the chance to navigate through a progressive image transmission and scalability.

FlashPix format is not power hungry. *FlashPix* format can be manipulated with a standard multimedia PC, with an Intel Pentium processor with 16 MB of RAM. Consequently, the memory and disk space required to edit images is reduced.

FlashPix structured storage format provides compatibility with Microsoft's OLE structured storage format and other structured storage paradigms. Structure storage can be likened to a '*file system in a file*'; a structured storage file contains both storages (directories) and streams (files)[5].

FlashPix tiles can be uncompressed, single colour compressed or they can use JPEG lossy compression, depending on the application.

The *printing* of the images gives the expected quality and it gives the opportunity for storing *metadata*. It groups non-image data into the following groups: File source and intellectual property.

If the digital images of museums shall deliver *FlashPix* images on the Internet, the Web server must be running the LivePicture Image Server (Live Picture). They can be viewed using a Web browser in a HTML page or in a Java Applet Viewer.

This image format is widely used in museum web-sites (e.g. the National Museum of Korea (National Museum of Korea), the Fine Arts Museum of San Francisco (Fine Arts Museums), the J. Paul Getty Museum (Marshak *et al.* 2003), the Museums of Vatican (Museums of Vatican) and the Metropolitan Museum of Art in New York (Metropolitan Museum of Art).

FlashPix format did not get the reception that was predicted, but some of its features are adopted by *JPEG2000* image format.

5.2. JPEG2000 format

The ISO/IEC Joint Technical Committee of Photographic Experts (JPEG) has developed an international standard for interactivity, under the name *JPEG2000*. The basic philosophy of *FlashPix* that gives the ability to the user to interact with the image, by panning or scaling the image or changing its resolution through zoom, has been maintained.

Adobe Photoshop and Corel PhotoPaint can handle JPEG2000 images, but they need a special plug-in software. In order to view JPEG2000 images using a browser, a specific viewer application should be used. In contrast with *FlashPix* servers (who upload the viewer automatically), this viewer must be downloaded manually and the web sites shall have a link to this appropriate software.

The main features that make it a very promising image format are:

• In *JPEG2000* there is the potential of **progressive transmission** of an image and scalability. It has different resolutions of an image in one file and thus image sizes range from thumbnail to full size of the original image.

• An important distinction between *FlashPix* and *JPEG2000* format is that the image can be **progressive either by resolution, or by quality**. Certain regions of the images can be stored with better resolution or higher quality than other ones.

• It is possible for the user to define an arbitrary shaped **Region of Interest** (ROI), where the image quality is enhanced compared to the quality of the remaining regions.

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[5] This feature allows the extensibility of this format, since developers can add features without converting the image to a new format (Georgoula, Patias 2002, Georgoula Patias 2003).

- An image with this format can have high **compression efficiency**[65].
- It is designed taking into account the need for **interoperability**. *JPEG2000* is fully compatible with previous versions of the format. It is adherent to standards, like XML, HTTP[76].
- As for comparison with the *FlashPix* format, *JPEG2000* fares well also, concerning metadata. It has **extensive metadata possibilities**. It should be noted that *JPEG2000* format is XML based metadata.

Institutions such as the Cultural & Educational Technology Institute, in Greece (Politou *et al.* 2003) have used *JPEG2000* standard in databases with large amounts of data in 'Ark of Refugee Heirloom' project that records the cultural heritage of a part of the Hellenic population.

6. Test performance and comparison

For the purposes of the comparison of *FlashPix* and *JPEG2000* image formats, an Internet test has been implemented.

6.1. Preparation of the tests

An image has been scanned in 600 dpi (dots per inch) and a digital image of 5000 by 5000 pixels has been created. It is then converted to *FlashPix* and *JPEG2000* image formats accordingly. The *JPEG2000* test image had 4,47 MB size, whereas the *FlashPix* one had 97,4 MB[8]

Then, two servers have been set up, one for *FlashPix* and one for the JPEG2000, on the same machine. For *FlashPix* the iSee Zoom Image Server 4.5 (60-day free trial version) (iSee Zoom Image) has been selected, since it is a highly flexible and easy-to-use, with extensive documentation and very good results. For *JPEG2000*, the Kakadu server 4.2 has been selected as more simple and easy-to-use. Some parts of Kakadu software are free and can be downloaded from the Internet (Kakadu Software).

The system on which the servers set-up, met the minimum requirements for a server application:
- Microsoft Windows 2000 Server with Service Pack 4
- 256 MB hard disk space for server software
- Additional space for images as required
- 512 MB RAM

6.2. Test results

In order to test the simplest case, the client PC was connected to server using a 56Kbps PSTN modem. On both environments and tests, client PC required from server a 500 by 350 pixels region of the test image, in different zoom levels (layers).

The results of our test in the Internet are presented in Table 1:

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[6] It is better than *FlashPix* and JPEG that provide only lossy compression, because *JPEG2000* can have either high quality lossless or lossy compression. In comparison to JPEG, *JPEG2000* format has better image quality at the same file size and even in high compression ratios and 25–35% smaller file sizes. Also, it shows 40% compression efficiency improvement over the *FlashPix* format (*JPEG2000* Resource Web Page).

[7] It seems as if *JPEG2000* image format will also have extendibility, meaning that it can be extended to another image format in the future. On the other hand, as with *FlashPix* format there is the danger of technology obsolescence, in case it stops to be supported, so as reading or displaying *such format* images would be difficult or even impossible.

[8] The difference between the test image sizes is due to the fact that the "trial version" of the *FlashPix* server did not allow creation of compressed images.

	FlashPix	JPEG2000
1st zoom	55 sec	45 sec
2nd zoom	47 sec	40 sec
3rd zoom	23 sec	18 sec
4th zoom	–	49 sec

There are not considerable differences in times. Furthermore, it should be noted that *JPEG2000* has greater zoom depth, than *FlashPix*. Actually, JPEG2000 viewer could zoom as much as we wanted, in contrast with the *FlashPix* java viewer which could show details up to a bottom layer.

7. Summary and conclusions

There have been presented the old conventional file formats and two image file formats that have a new imaging architecture, *FlashPix* and the upcoming *JPEG2000* that have been developed to better address issues of compression, quality and speed of delivery of the images. The results of a performance test and a comparison between these two image formats, in the Internet have been discussed.

There is the need for an image format that can be used by virtual museums on the Internet and can be delivered on the Internet interactively and in a scalable progressive way. Furthermore, this image format shall minimize the storage costs and have the ability to be transmitted in a fast way. *FlashPix* image format has a quite good performance, but has also several disadvantages. *JPEG2000* includes some of the characteristics of *FlashPix* format and is a very promising image format. Though, it is still under development. The Internet browsers should be able to view and more software packages must handle efficiently *JPEG2000* images and a more extensive documentation of the servers should be available.

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Glossary of Internet Terms

Internet – a Network of Networks

Cyberspace: This is the 'electronic' world as perceived on a computer screen; the term is often used in opposition to the 'real' world. Term originated by author William Gibson in his novel *Neuromancer,* the word Cyberspace is currently used to describe the whole range of information resources available through computer networks. Can all refer to the same machine, but each domain name can refer to no more than one machine.

Blog: Web LOG. A journal kept on the Internet. This journal is often updated daily and contains all information that the person maintaining the BLOG (the blogger) wishes to share with the world (www.avatar.co.nz/resources/web-site-design-web-marketing-definitions-b.html)

Home Page: The first, introductory page at a Web site, from which other pages at the site can be accessed. Also, a site on the Web where an individual, school, company, or other organization may present its own assortment of articles, graphics, and links.

Hypertext: Text which is not constrained to be linear

Hypertext Links: Highlighted and/or underlined words or images on a Web page which link that page to other related pages or files. Navigation is accomplished by clicking a mouse on the hypertext link.

IP Number: Internet Protocol Number. Sometimes called a dotted quad. A unique number consisting of 4 parts separated by dots, e.g. 165.113.245.2 Every machine that is on the Internet has a unique IP number – if a machine does not have an IP number, it is not really on the Internet. Many machines (especially servers) also have one or more Domain Names that are easier for people to remember.

Internet: The worldwide network of computer networks that are connected to each other, providing file transfer, remote login, e-mail, news, and other services. The vast collection of inter-connected networks that are connected using the *TCP/IP* protocols and that evolved from the *ARPANET* of the late 60's and early 70's.

Internet Service Provider (ISP): Any organization that provides direct Internet access.

Network: Any time you connect 2 or more computers together so that they can share resources, you have a computer network. Connect 2 or more networks together and you have an *internet*.

Node: Any single computer connected to a *network*.

Online: You are 'online' when your computer is connected to a host computer, providing access to the Internet.

PODCAST: According to the New Oxford American Dictionary, a podcast is 'a digital recording of a radio broadcast or similar program, made available on the Internet for downloading to a personal audio player', but the generally accepted definition has expanded to include video as well as audio (www.bbn.com/glossary/P)

Portal: Usually used as a marketing term to describe a Website that is or is intended to be the first place people see when using the Web. Typically a 'Portal site' has a catalog of web sites, a search engine, or both. A Portal site may also offer email and other services to entice people to use that site as their main 'point of entry' (hence 'portal') to the Web.

RSS: Really Simple Syndication. An XML-based system for aggregating and rapidly scanning information from blogs, news and current event Web sites, and other Web sites that update content frequently (www.chrsolutions.com/TelecomGlossary.html)

URL: Universal Resource Locator. The 'address' of a Web page. Most URLs begin with the prefix http://, but you may also see ftp:// (file transfer protocol) in a URL.

URI: Uniform Resource Identifier. An address for s resource available on the Internet. The term URL is basically synonymous with *URI*. URI has replaced URL in technical specifications. It contains: type of file, domain name computer file is on and its location on the Internet, path or directory on the computer to this file, name of file, and its file extension (index.html). For example: http://www.google.com

World Wide Web (WWW): A collection of multimedia pages and resources that sit on the Internet and which are woven together through the use of hypertext links. World Wide Web (or simply Web for short) is a term frequently used (incorrectly) when referring to 'The Internet'. The universe of hypertext *servers (HTTP servers)*, more commonly called 'web servers', which are the servers that serve *web pages* to web *browsers*.

Web Host: A company that allows individuals or other companies to use their server space to host web sites.

Webmaster: The person in charge of implementing and modifying a web site.

Web Page: A single document on the World Wide Web that is specified by a unique address or URL and that contains text, hyperlinks, graphics, sound, video and other special effects.

Website: The entire collection of web pages and other information (such as images, sound, and video files, etc.) that are made available through what appears to users as a single web server. Typically all the pages in a web site share the same basic URL. The term has a somewhat informal nature since a large organization might have separate 'web sites' for each division, but someone might talk informally about the organizations' 'web site' when speaking of all of them.

Web Server: Computer hardware where web pages are stored and accessed by others using web client software, or the computer software that allows the user to access the web pages. See also server.

WWW or W3: World Wide Web: The World Wide Web is sometimes considered the graphical interface for the Internet, which is the network itself. Sometimes the web sites and their pages are called the World Wide Web. Often the two terms WWW and Internet are used interchangeably. The most important feature of the WWW is its inherent ability to link to any other part of the web. These links are sometimes called hyperlinks.

Web 2.0: a phrase coined by O'Reilly Media in 2004, refers to a perceived second-generation of Web-based services – such as social networking sites, wikis, communication tools, and folksonomies – that emphasize online collaboration and sharing among users.

Wiki: 'Wiki wiki' means 'rapidly' in the Hawaiian language A website or similar online resource which allows users to add and edit content collectively (www.tvb.org/multiplatform/Multiplatform_ Glossary.asp)

File Types

ASCII: American Standard Code for Information Interchange. This is the de facto world-wide standard for the code numbers used by computers to represent all the upper and lower-case Latin letters, numbers, punctuation, etc. There are 128 standard ASCII codes each of which can be represented by a 7 digit binary number: 0000000 through 1111111.

HTML: HyperText Markup Language. The coding language used to create *Hypertext* documents for use on the *World Wide Web*. HTML looks a lot like old-fashioned typesetting code, where you surround a block of text with codes that indicate how it should appear. The 'hyper' in Hypertext comes from the fact that in HTML you can specify that a block of text, or an image, is linked to another file on the Internet. HTML files are meant to be viewed using a 'Web Browser'. HTML is loosely based on a more comprehensive system for markup called SGML.

PDF: Portable Document Format. A file format designed to enable printing and viewing of documents with all their formatting (typefaces, images, layout, etc.) appearing the same regardless of what operating system is used, so a PDF document should look the same on Windows, Macintosh, Linux, OS/2, etc. The PDF format is based on the widely used Postcript document-description language. Both PDF and Postscript were developed by the Adobe Corporation.

XML: eXtensible Markup Language. A widely used system for defining data formats. XML provides a very rich system to define complex documents and data structures such as invoices, molecular data, news feeds, glossaries, inventory descriptions, real estate properties, etc. As long as a programmer has the XML definition for a collection of data (often called a 'schema') then they can create a program to reliably process any data formatted according to those rules. An open standard for exchanging structured documents and data over the Internet that was introduced by the World Wide Web Consortium (W3C) in November 1996 (www.shop-script.com/glossary.html).

Image File Type

GIF: Graphic Interchange Format. A common format for image files, especially suitable for images containing large areas of the same color. GIF format files of simple images are often smaller than the same file would be if stored in *JPEG* format, but GIF format does not store photographic images as well as JPEG.

JPEG: Joint Photographic Experts Group. A digital image file format designed for maximal image compression and often used to display graphics on Web pages.

MPEG: Moving Picture Expert Group. Compression format for digital video.

MP3 is slang for 'MPEG Layer-3' a set of industry standards for digitally encoding video and audio information.

PNG: Portable Network Graphics. A graphics format specifically designed for use on the World Wide Web. PNG enable compression of images without any loss of quality, including high-resolution images. Another important feature of PNG is that anyone may create software that works with PNG images without paying any fees – the PNG standard is free of any licensing costs.

TIFF: Tagged Image File Format. An uncompressed image format storing high resolution bit-mapped images appropriate for publishing.