

Usability of Virtual Museums and the Diffusion of Cultural Heritage

Reflexions on virtual and real exhibits design, for public education and entertainment.

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Table of contents

<i>Abstract</i>	4
Introduction	5
1. The public and the educational goal	5
1.1. The visitor's meaning construction.....	6
1.2. ICTs advantages	7
2. Virtual museums	9
3. Effective design models	11
Conclusions	17
Acknowledgements	18
Bibliography	19

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Abstract

Priorities for museums are changing. The mission of the new museology is to convert museums into places of enjoyment and learning, bringing their financial management into line with the social enterprises competing with the entertainment industry.

As time goes by, museums need to establish and apply the criteria necessary for their survival, paving the way for other public institutions to open up in their attempt to communicate and spread their heritage.

We can already see some commonly accepted conclusions about visitors' behaviour, which can help plan future exhibits that present learning as a constructive process, collections as objects that bring meaning, and exhibits themselves as communication media that should transform the way spectators think, serving as the message itself.

Internet seems to represent an effective medium to reach these objectives, as it capable of: a) adapting to the interests and intellectual characteristics of a diverse audience; b) rediscovering objects' meanings and offering sociocultural recognition of their value through its interactive potential, and c) employing attractive and stimulating elements for everybody's enjoyment.

With this in mind, we have to ask ourselves: What criteria should a virtual museum respect in order to optimise the diffusion of its heritage? What elements stimulate users to stay on a web page and have satisfactory virtual visits? What role does the application's usability play in all of this?

Keywords

Virtual museums, communication, usability, constructivism, design.

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Introduction

Post industrial culture, dominated by consumption, mass media and the narcissistic obsession for individual welfare has shaped museums in the past decades as a tool for selling cultural goods, where profit and the attraction of the masses give a new meaning to the institution.

Proliferation of museums and other cultural offers like cinema, theatre, sport events, music concerts and all sorts of spectacles have obligated museums to utilize new marketing tools that until now were totally absent from this environment, in order to attract a great number of visitors. Thus, external diffusion has multiplied its effect by adopting strategies that are proper of commercial promotions because of the use of mass media, including the use of internet. In the meantime, information services have taken an essential role in the diffusion of the museum's corporate image, in the advertising of temporal exhibits and other diffusion activities which represent the museum's background.

Museum's current situation has been preceded by deep transformations in their identities. The confidence of their recovery is found in the spirit of the so called "new museology" that sponsors the approach of contents and functions with the necessities of their socio cultural surroundings. For this purpose ICOM (International Museums Council) committees in the last years have been orientated to pave the road so that these institutions may fulfil the mission of serving the community. ICOM itself, aware of the current changes in our society tries to establish relationships between museums and current technological advances.

As a result, hypermedia solutions and the Web are likely to answer to the new museology's concern of projecting museums toward a social dimension.

Diffusion should be understood as a group of actions directed to advertise a museum and gather anything necessary (mediums and instruments) so that it can be appreciated, valued and enjoyed by the most possible numbers of visitors.

At the same time we cannot hide that the new services usually found in museums are of more interest for the visitors than the exhibits themselves. Souvenir shops, restaurants, and even restrooms are factors that compete with exhibitions to attract a visitor's attention.

1. The public and the educational goal

The educational goal that museums should have has been one of the most analyzed factors since their renovation decades ago. UNESCO as well as ICOM works to strengthen their didactical and cultural dimensions for which is necessary the study and observation of their target: the public.

The development of an audience is conceived in a broad manner, including both the objectives of increasing access and the basis of an audience and also the necessity of constructing a tighter relationship with visitors, cultivating and stimulating them in order to make them more connected with the organization.

The concept of audience is therefore united to the concept of the museum itself, which must have as one of its objectives the offering of quality cultural services capable of satisfying visitors' demands and necessities. For example, Dodd y Sandell (1998), define the development of public as a task of "bringing down barriers" that might difficult the access to museums and of "building bridges" with different groups to assure that their actual necessities are met¹.

1.1. The visitor's meaning construction

A museum must try to attract numerous visitors, but moreover it should try to make them repeat their visit, which will be considered as recognition of the satisfaction for the services rendered.

One of the bets of a museum's diffusion activity is to facilitate visitors with an interpretation of their heritage. For this the diffusion's area collaborates with curators and professionals in the design and montage of museographic back ends, creating didactic materials that enable visitors to contextualize objects in the exhibits.

The strengthening of contextualized knowledge as a source of awareness of the social reality and the tendency to include aspects that were before emarginated, for example the aesthetic and the ethic, the affective and the legitimating of effective practices of social actors as an instance of reflection and retrieving of the knowledge that are not directly objective or quantifiable but are however effectively present in the depiction of the social world and the possibilities of its interpretation articulates a substantial change in the function of museums and the cultural heritage that they manage in contemporary society.

According to Susan Pierce (1986), the object must have the capacity of communication. It must have a language in order to explain its status as an exponent of meaning and its testimony of the cultural evolution of humankind. The object therefore needs a medium with which we can rediscover its meaning and recognize its socio cultural value. In the measure that we get to know its cultural context in which it was brought to life, we can establish a link with it. Therefore in a visitor's relationship with the expository message there is a complementary informative necessity (verbal, iconic and three-dimensional) that facilitates the understanding of scientific discourse.

Objects' exposition is the medium for communication and constitutes a dialogue with visitors. Not all social, ethnic, regional, occupational sectors are linked today and are neither linked to the past with the cultural heritage in the same manner.

A good policy for diffusion must consequently reach an objective to democratize access to culture as a factor that contributes to social progress and the increase in liberty and equality, procuring revenue from cultural heritage which is achieved through the satisfaction and recreation of everybody, and educate the diverse sectors and ages in knowledge.

One of the conclusions commonly admitted about the behaviour of visitors that we must have present is the planning of expositions which considers learning as a process in which a spectator participates to learn and constructs meanings deeply personalized.

¹ Dodd, J., Sandell, R (1998). *Building Bridges, Guidance for museums and galleries on developing new audiences*. Londres, Museums and Galleries Commission.

Most studies that have taken place in this sector show that visitors often construct meanings from the contents implied in an exposition. For example, Silverman (1991) affirms in his studies, that visitor constructed meanings about themselves (their identity, their place in this world, the meaning of their lives) from an exhibit. Moreover, Spock (1999) also noted that visitors used exhibits as metaphors to obtain meanings from other experiences that had no relation with their visit.

To assume that a visitor constructs meanings only from the explicit content of an exhibit limits and reflects the principles of expert beginner cultural transmission. Therefore, it is legitimate to think that visitors construct deeply personalized meanings or totally none related to the explicit subject.

There is talk about an active attitude of the public because visitors activate a series of cognitive habits before a museum's proposal that allows them to comprehend cultural heritage. The visitor as a social subject is required by diverse social discourses and as an actor of his time and social status he has diverse semiotic competences that he has acquired by social interaction.

Thus, in each opportunity he access a museum's proposal, he selects an strategy for a possible route in the exhibit, evokes what he has already seen and heard, a sequence of signs that are in accord to "his mental disposition" and from it he identifies himself, alienates, becomes surprised, ignores or rejects the subject (historic or contemporary) proposed by the exhibit. His mind remains active even though he does not move in front of a painting.

The museum can propose a menu with of possible lectures or identify explicitly what it holds as an institution, but the effective lecture will be the one that the visitor will finally make.

1.2. ICT's advantages

The use of technology comes along with an important change of mind that affects scientific constructions, transmission and acquisition of knowledge, learning strategies, and literary and plastic creation.

Electronic expression leans on a series of specific procedures and techniques that affect both the discourse articulation and its diffusion's mechanism, allowing an absolute integration of images, text and sounds that enable the transmission of artistic creations anywhere, even the most remote places in the planet. Moreover, this new medium offers the artist the possibility to organize and relate discursive elements in accord to a concept that goes over linearity in the conventional expression.

ICTs offer a new dimension of interaction between images and text over which hypertextuality lays its foundations. Cyberspace is shifting both artistic consumer's habits and social access to works of art, reflecting the transformation of cultural behaviours, marked by an approximation of culture and leisure and by the commercialization of artistic manifestations (galleries). This possibility offers a new dimension in the interaction between images and text.

Hypertext designs a new way of managing and organizing information in a similar way like the human mind operates. For example, hypertext in the educational sector facilitates through links a simultaneous focus of a theme from its different perspectives. This favors the student's individual learning which allows him to learn according to his interests and his back ground knowledge.

Heritage is a field of study that requires the participation of the different areas of knowledge. Relationships between the diverse discourses that disciplines offer in their effort to interpret it can be integrated in a coherent way through hypertext links that give the subject matter a new dimension and depth which is achieved by integrating the diverse intervention of knowledge in the interpretation of heritage. As result, major contextualization is achieved which directly affects its comprehension. The associative links convey an extended and rigorous discourse and not a succession of inconex text fragments.

Another important characteristic of information technology is the interactivity which according to Joan Ignasi Ribas² is defined as “the condition of a communication between transmitter and receptor in which information and its sense is exchanged by the will of the receptor”.

With interactivity we can achieve reciprocal communication that takes place when the receptor has the capacity to intervene when choosing information that flows from a transmitter. With this communicational capacity, interactivity offers participative capacity.

By interacting, a user is no longer a passive spectator, and is able to make decisions and become an active subject that can interact over the mass of information, selecting, modifying and altering its content. This allows exerting a participative action over works of art and over the way this work is perceived, which becomes an object, subject to changes and modifications made by the spectator, which becomes a co protagonist in the creative process.

With didactical use, interactivity offers enormous possibilities in both image study and iconic culture, fundamental pieces of our audio visual society. Interactive constructions constitute nowadays the best vehicle to transmit a message of great expressive force. They invite users from admiring a visual work to understanding it, allowing the inclusion of the work in its own context, facilitating further queries about the motivation behind it. The deepness of these queries will depend on the user's will.

Finally, we cannot avoid talking about Multimedia/Hypermedia. Hypermedia systems have a series of advantages for the user: they allow the association of many different types of information (textual, graphic, visual, sounds) that facilitate access to information, establishing multiple perspectives.

The first advantage that hypermedia offers in the history of art is precisely it's demystifying as a discipline only attentive to the untouchable master piece. With the digitalization process of works of art a definitive de-sacralisation takes place, demystifying and returning it to its authentic image dimension. The work becomes again a human object and an instrument for communication, without sacralisation that cultural convention had imposed.

Hypermedia also allows to simulate the original settings of the work through the recreation of 3D spaces, which facilitating comprehension of the initial functionality for which it was created and also offers enormous didactical possibilities for the study of the image when it allows a user, an active user, the option to choose a concrete work, an interesting detail, and even include punctual information about it.

² Joan Ignasi Ribas (1990). *El videodisco interactivo*. Fundacion Serveis de Cultura Popular, Editorial Alta Fulla, Barcelona.

We can therefore affirm that hypermedia encourages a constructivist path for learning when it gives technological resources to students which allows them to overcome the traditional discourse linear of teaching, making it possible for interactivity to translate itself in a goal of a personalized reception. The student has before him diverse options which will allow him to become deeper according to his learning rhythm.

2. Virtual museums

Interest to interactive and multimediality application in museums begins in 1991 with ICHIM *International Conferences on Hypermedia and Interactivity in Museums* and rapidly develops. Many museums establish its presence in the web and in 1997 the American group (Archimuse) Archives & Museum Informatics³ institutes *Museums and the Web* an annual conference that facilitates the exchange of information and debates between professionals of this sector.

In Europe, a net of specialists known as Digi CULT (2001/2004) that have written a report about the future of digital technologies in the cultural heritage area with the collaboration of members of the united states, Canada and Australia. This report comprehends a series of recommendations aimed at governments, administrations and museums that incite to a major contextualization, explanation and interpretation of the objects of collections through digital resources, the creation of immersive-interactive settings, personalization, intelligent guides or collaborative work, organization of digital infrastructures to take advantage of opportunities arisen from the digital revolution, etc.

The World Wide Web offers museums several advantages. Amongst them we cannot forget savings in travel expenses related to a visit to a museum thanks to remote access, the possibility to transcend space and time limitations related to a traditional museum, the democratization of the institution ever more accessible and open to a public involved with the general cultural project.

Virtual museums' apparition is encouraging a new type of spectator linked to them. It's a type of visitor closer to an astronaut than to a pedestrian, which doesn't follow a default route or a limited path. Instead this visitor can go from one painting to another without having to walk through the whole gallery or follow a guided visit step by step, with all sorts of explanations. At the exit, this visitor can also make a purchase from a distance at the gift shop of this virtual museum.

In this sense we can firm that various similitudes between an actual and a virtual visit exist: designing an actual exhibit or a web page must contemplate the free choice of visitors, over which experience gets structured (Falk and Dierking, 1998, p. 8f). Both museum visitors and Internet users must therefore:

- Voluntarily visit an exhibit
- Don't have to achieve objectives in a given time frame
- Are not motivated by any reward
- Shift their attention if bored
- Are not required to be attentive
- Expect an informal rather than an academic environment (Ham, 1992).

³ Archives & Museum Informatics is a partnership de David Bearman, President of Archives & Museum Informatics and Jennifer Trant, consutor of digital strategies and collaboration.

Both types of visits are centred in meaning making and for this information are required.

In a traditional environment, a visitor moves to another exhibit if bored whereas in Internet, a user moves with a click to one more attractive if he is not satisfied with the one his visiting. In this case it's worth mentioning that what counts is not the amount of information but its quality. A simple presentation of information on the web does not give additional value to the data that is given, which is worthless for those unable to analyze and interpret it.

This is why, when designing a website it's very important to have in mind the principles of interpretation in order to retain the visitor's attention. The use of technological resources favors the contextualization of the rests and the historic legibility when they use their interactive potential and foment aesthetic enjoyment when attractive designs and practical navigation is implemented in a web page.

Given that communication is the result of a relationship between personal factors, knowledge and prior experiences, motivations and attitudes, culture and background, social mediation) and context (design and content presentation, social factors, etc...) (Falk and Dierking 1995^a:11), it is supposed that a context design in an adequate matter (rich in thematic and intellectual relationships, associative explorations, personalization options, etc.) must in fact stimulate a user's interest for cultural heritage.

In his study, "*The influence of exhibit space design features on visitors attention*", Mark Harvey from Colorado State University, affirms the following "Based on the results of the survey study, the most important for determining the visitor experience, both in terms of eliciting focused concentration and reflecting what important to visitors, were interactive components, multi sensory stimulation, and dynamic displays"⁴.

Considering knowledge as an active, social and contextual process (Hein 1991: 90-91) and a museum visit an experience that is both educational and entertaining, we can assume that virtual museums must have an enormous potential.

A virtual museum's traditional mission of communicating cultural heritage cannot rescind of the use of attractive web pages and the use of effective communicational strategies to retain a user who by his own choice starts a visit, keeping him interested and motivating him to deepen his knowledge. In this general frame, focus oriented to *edutainment*⁵ can absorb the triple function of: giving museum visitors a pleasant learning experience, add value to a visit in terms of interactivity and contribute with communication and the exhibit's promotion.

What characteristics must a website have to take advantage of the World Wide Web potential and stimulate users to stay, get involved with heritage and with the institution and further their interest for the museum's collections?

⁴ Harvey, M.L. (1995). The influence of exhibit space design features on visitor attention. Unpublished doctoral dissertation. Colorado State University, Fort Collins, Colorado.

⁵ Is the union of two English words Educational Entertainment and its objective is to educate through entertainment, presenting themes through a media familiar to us, like video, music, films, video games or the fusion of some of these media.

In a similar situation, it becomes impossible not to question how to improve computer technology's given opportunities and to wonder what characteristics fulfil the cultural and didactical mission of museums in an information society.

3. Effective design models

Although many museums possess interesting collections, some are unable to design virtual or actual exhibits that can both educate and entertain the public.

The problem lies on the lack of funds and competence in the strategic presentation of objects. For example, in Spain, we find a very homogeneous typology of virtual museums that present navigational problems due to the size of their graphic resources or functionality problems in their structure and navigation⁶. In these cases these museums do not take ergonomics (the possibility that an average user can navigate through the web without any problems), or the basic principles of usability in consideration.

Very different from software, the Web has an enormous diffusion and therefore users' profiles and contexts are very varied. To face this complexity we must examine two qualitative characteristics:

- The accessibility of content that consider users' different typologies and contexts of use.
- Usability with which efficiency, satisfaction, security and effectiveness are synthetically indicated.

A website is accessible when its informative content, its navigational modes and its interactive elements can be of use to all users independently of their handicaps, the technology used to access the site and the context they belong to.

Just to give an idea of how broad this definition is we should make evident the scenarios described in the introduction of guidelines of the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C):

"For those unfamiliar with accessibility issues pertaining to Web page design, consider that many users may be operating in contexts very different from your own:

- They may not be able to see, hear, move, or may not be able to process some types of information easily or at all.
- They may have difficulty reading or comprehending text.
- They may not have or be able to use a keyboard or mouse.
- They may have a text-only screen, a small screen, or a slow Internet connection.
- They may not speak or understand fluently the language in which the document is written.

⁶ Ex. Museo de Arqueología de Álava (<http://158.227.232.134/mitoi/museo5.htm>), Museo de Prehistoria e Arqueología de Vilalba (<http://www.cgmuseos.org/vilalba.html>), Museo de arqueología e historia de Melilla (<http://www.arkeomelilla.galeon.com/Inicio.htm>), Museo de Prehistoria y Arqueología de Cantabria (http://www.gobcantabria.es/portal/page?_pageid=33.31132&_dad=interportal&_schema=INTERPORTAL&_item_id=211909&_group_id=33&_page_id=41635), MUSEU ARQUEOLÒGIC MUNICIPAL DE BOCAIRENT (http://www.caixaontinyent.es/patrimonio/v_a/bocairent/bocairent_r11.htm), Museo Cerralbo (<http://museocerralbo.mcu.es/esp/recorrido/jardin.html>).

- They may be in a situation where their eyes, ears, or hands are busy or interfered with e.g., driving to work, working in a loud environment, etc.).
- They may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system.” Usability is “the degree, with which a product can be used by specific users in order to achieve specific goals with efficiency, effectiveness and satisfaction in a specific context of use.”⁷
- Effectiveness of a product indicates the precision and exhaustiveness with which users reach certain goals.
- Efficiency in the use of a product indicates resources utilized by a user in relation with precision and exhaustiveness of the goals achieved
- Satisfaction shows that annoying or uncomfortable elements are not found and it also shows a favorable attitude of a user towards a product.
- Context of use comprehends the user, the task that needs to get done, available hardware and software resources and the physic and social environment in which the product is used.
- The product is the web site previously defined.”

To develop a website involving users in all the phases of the project is not always possible because of the employment of human (samples of users, usability professionals, etc.), organizational and financial resources that are rarely available.

Through experiences obtained by the use of methodology, usability experts have proposed a series of principles that can guide a project and reach efficiency, effectiveness and satisfaction in the development of websites. Applying these principles to the design of websites has taken place in the Minerva Project. Usability criteria for cultural websites and virtual museums were selected. These criteria have been divided in categories that represent users' satisfaction expectations.

We list here categories identified by Minerva eC, which can be subdivided in more detailed sub criteria functional for product analysis. The list is filled with comments regarding web sites' design usability and human factor that were elaborated by Nielsen (1999), Marcus y Gould (2000), Bernard y Larsen (2001), Ngo and Byrne (2001), Riley (2002), which gives us concrete examples about human tendencies, users' expectations and their psychological limitations.

TABLE 3. Functional criteria for the analysis of cultural heritage web sites.

Content	Recognize a site's typology a. Information about the cultural institution b. Information regarding copyright and advertising policies
	Recognize a site's typology a. Information about the cultural institution b. Information regarding copyright and advertising policies
	Recognize the site's mission a. Information of the site's principal objectives b. Information regarding the person in charge of the site, which can provide support and general information about the application. c. Information about maintenance strategies

⁷ ISO 9241-11 Ergonomic requirements for office work with visual display terminals - Guidance on usability.

	<p>d. Information about technical issues that enhance the sites' functionality.</p> <p>To have an idea about the site's content in order to access to a specific sector</p> <p>a. Data organization according to predictable criteria (themes, periods, authors, etc.)</p> <p>b. Data organization according to a logic structure, coherent and easy to understand</p> <p>c. Content distribution in a functional manner within the site.</p> <p>d. Clear criteria grouping of objects.</p> <p>e. Information regarding the site's members support.</p> <p>Quality content availability</p> <p>a. Valid and current information</p> <p>b. Exhaustive information regarding relevant aspects that might interest possible users</p> <p>c. Easy to understand content</p> <p>d. Synthetic and concise texts</p> <p>e. A unique key idea for every paragraph.</p> <p>f. Visible key words and important phrases</p> <p>g. Interesting information (data, links to other resources, etc.) presented with multimedia tools.</p> <p>h. Dynamic media (audio, animations, video, 3D graphics) presented in a rhetoric style adequate for the message's transmission.</p> <p>i. Multiple language options for crucial information</p> <p>j. Texts following grammar and composition rules.</p> <p>k. Identification of the texts' author and his competence with the theme.</p> <p>l. Objective and politically correct information.</p> <p>m. An attractive and original application for the user that can offer a good reason to come back.</p>
Contents' layout	<p>Functional layout</p> <p>a. Fast learning of Multimedia tools</p> <p>b. Efficient and profitable organization of information</p> <p>c. Layout of items that are up to users' expectations⁸.</p> <p>d. Balance in the site's item lay out⁹</p> <p>e. Important items should be easy to reach for a user¹⁰.</p>

⁸ Users have grown accustomed to looking in certain areas on a screen to find specific items (Bernard, 2001). Analyzing users' expectations of where they expect specific web objects to be located revealed that generally,

- Internal web links were expected to be located on the upper left side of the browser window.
- External web links were expected to be located on the right side or lower left side of the browser window.
- The "back to home" link was expected to be located at the top-left corner and the bottom-center of the browser window.

- The internal search engine was expected to be located at the top-center of the screen, and
- Advertisement banners were expected to be located at the top of the browser window.

In follow-up study (Bernard, 2002) that analyzed participants who bought at least one item online revealed that:

- The login/register button was expected to be located at the upper-left corner of a web page.
- The shopping cart (basket) was expected to be located at the top-right corner of a web page.
- The help button was expected to be located at the upper-right side.
- Links to specific merchandise items were expected to be located at the left upper-center of a web page, and
- The account/order button was expected to be located at the upper-right of a web page.

⁹ Humans on a preconscious level seek structure in the things they see. Seeking the appropriate balance among things, as well as unifying those things that are related will generate structures that are not only pleasing to the eye, but will make the interface more understandable.

¹⁰ Generally speaking, it states that the smaller and farther away an object is, the longer it will take to reach that object (Fitts, 1954).

	<p>f. Closeness of related items¹¹.</p> <p>g. A layout that acknowledges different cultural conventions¹²</p> <p>Functional graphic elements</p> <p>a. Exclusion of superfluous element that may compete with the ones that are needed¹³.</p> <p>b. Functional colour use</p> <p>c. Icons, symbols, text links, images, etc. that act as a predictable preview of the related content and the interaction effects.</p> <p>d. Objects' Properties and use presented in a clear and didactical manner¹⁴</p> <p>e. Alternative text for every type of image and multimedia content.</p> <p>Functional multimedia elements</p> <p>a. Control over any applicable archive (<i>Play, Pause/Resume, Stop, Rewind, Fast Forward</i> y Volume)</p> <p>b. Moderated use of animations¹⁵</p> <p>c. Adequate dimension of objects and opportune communications for users</p> <p>d. Self explaining interactive elements</p>
Navigation	<p>a. Clear links</p> <p>b. Identifiable links even out of their context through explanation phrases</p> <p>c. Links to relevant materials</p> <p>d. Rapid access and localization to items necessary for a task</p> <p>e. The option to rapidly return in a simple manner to any given part of the site</p> <p>f. Information about one's location when exploring the site¹⁶.</p>

¹¹ The unity of the interface is important because it has the potential to link concepts and objects together that belong together.

¹² Various cultures respond to layout designs differently. Research examining multicultural differences and their interaction with website design is sparse--mostly coming from Marcus and Gould's (2000) application of Hofstede's (1991) research on world culture to web design. Hofstede stated that world culture consists of five dimensions, four of which are relevant to the Web.

The first dimension, power-distance, refers to the degree in which individuals with less power expect and accept unequal distributions of power within a culture.

The second dimension, individualism, refers to the degree to which a culture emphasizes the self and immediate family over the society at large.

The third dimension, masculinity, refers to the degree to which traditional masculine roles of assertiveness and competition are emphasized.

The fourth dimension, uncertainty avoidance, refers to the degree to which individuals have anxiety about uncertain events.

¹³ To quote Mies van der Rohe, "less is more." Organize the interface by reducing un-needed visual elements as much as possible. That is, remove all unnecessary visual "noise." This will make the important objects that are there stand out even more.

¹⁴ Affordance provides us with clues as to the operations of things. More importantly for interfaces, however, are the perceived affordances which provide visual feedback that advertise affordances. For example, a link button may be perceived to afford clicking because of its '3-D' or 'raised' appearance. Consequently, it is often helpful to give link buttons the physical appearance of a button, or any object that affords clicking, in order for them to be seen as a button to be clicked (Norman, 1988).

¹⁵ In a study by Benway and Lang (1998), animated graphics showed no advantage over non-animated graphics.

Moreover, there is some evidence that animated graphics may even reduce text retention by serving to distract the user from attending to the textual information around the graphic (Wright, Milroy, & Lickorish, 1999). Studies have also been mixed about whether animated graphics are preferable to only text-based interfaces. It has been suggested that animated graphics should be kept at a minimum in order not to distract the user from the main points of the page, as well as to reduce the download time.

¹⁶ In order to reduce the risk for a user to get lost in the immensity of the web many sites use "active maps" and flowcharts", with indicators of the user's position or other perceptive elements (for example, different

	<p>g. The option to intervene in the state and behaviour of a multimedia object¹⁷</p> <p>h. Control actions that are clear to the user</p> <p>i. Criteria clarity when searching for an object</p> <p>j. Well explained search findings</p> <p>k. Easy and logical navigation of a search result¹⁸.</p>
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Besides of features relative to web page functionality and content quality, it is important to remark that a virtual museum must take advantage of the World Wide Web full potential in order to optimize its educational capacity, attractiveness and not fail in its intent to communicate like it has already been stated in this article. With this purpose, we cite the importance of the general user's interface (GUI) principal criteria that can be of help to elaborate a set of values to follow when designing interfaces capable of visually communicating facts, concepts and emotions in a successful and effective manner:

- Symbols
- Typographic elements
- Colour
- Static and dynamic graphical elements.

The educative mission is obtained through personalized routes, active participation, content implication and interactivity.

On the other hand, the interest in a web page is related with an attractive graphics, rich in the use of multimedia languages and with a presence of resources and services capable of being able to satisfy and involve the audience. These characteristics cannot rescind, as we have already stated, from the observation of the principles of usability and accessibility, indispensable to achieve possible users' satisfaction.

In order to list criteria needed in the design of the web pages is necessary to identify the elements that compose virtual museums and the resources that are usually offered to users. A site graphic of the products available on the web takes us to a site model that points to four classes of information present on virtual museums:

- a. Information about the web's structure (ex. Site map, FAQ, technical information, visit counter)
- b. Information about the real museum (museum's history, how to get there, how to visit, services offered, etc.)
- c. The virtual museum's resources (online collection, educational activities, on line promotion, partnerships, etc)
- d. Interaction resources (e-mail, blogs, chats, visit counter, etc)

backgrounds to distinguish different types of content, text tags to indicate if an object belongs to a specific group, etc.).

¹⁷ Users should be able to control the interaction with multimedia elements (for example, zooming in and out of images, control video and sound through common commands such as *play*, *rewind*, *fast-forward*, etc.)

¹⁸ Navigation through search results should be easy, for example, returning to the main list after navigating without having to use the navigator, moving back and forward, visualize links in an easy manner, etc.

Precisely in order to achieve this goal we need to exclude categories conceived as simple propaganda used in the real museum's promotion that do not have even the slightest information of exhibits, taking in consideration that they do not give any added value to the communication of cultural heritage, take advantage of the web potential re proposing a two dimensional aesthetic, typically found in press, without offering any educational dimension.

After our bibliographic and site graphic revision we can propose a list of basic criteria for the analysis and classification of virtual museums and establish if their web pages comply with educational goals, entertaining and cultural heritage diffusion. Such analysis must be made having in mind accessibility and usability criteria previously mentioned.

Content

Information quality

Is information clear? Is it exhaustive? Is it well organized?

Multi language

Is information presented in more than one language?

Multimedia languages use and combination

Are multiple multimedia tools used?

Services and resources

Services offered

Are many services offered?

Available resources

Are many resources available?

Resources typologies

What is their typology?

Navigation

Functionality of navigation

Is navigation functional?

Functions for users

Are the possibilities to intervene in the state or behaviour of multimedia objects rich?

Accessibility

What degree of accessibility does the site permit?

Presentation and graphics

Functionality in the information presented

Is the information presented functional?

Aesthetics

Is the webpage design attractive?

Communicational Strategy

Degree of interactivity

What degree of interactivity can be attributed to the site?

Degree of interaction/reactivity

What degree of interaction does the site has?

Degree of personalization

What is the site's capacity to adapt to different users' profiles?

Conclusion

Applying new technologies to help cultural heritage's diffusion can bring enormous benefits for its enjoyment but at the same time, being this new and poorly explored field it takes the risk of not taking full advantage of its full potential by re proposing only an electronic version of the historic version of art works.

Therefore, an adequate project for a virtual museum has to be composed of didactical, multimedia and interactive resources, which can facilitate the transmission of information, interpretation and historic reconstruction of the context in which these cultural objects were originally placed, becoming even more interesting.

Access and valorisation of content and of developed information in the society of information and knowledge constitute a civic and democratic value, to which an economic and occupational value is also added. In few words we can affirm that a virtual museum must facilitate information about the real museum (identity, localization, history, contents organized by sectors, collections, permanent and temporal activities, public active services, etc.) as well as information and advanced documentation for educational purposes and cultural tourism. Exhaustiveness is an element of quality in a virtual museum.

At last, a virtual museum should help scientific exploration through its databases, being a museum a center for investigation and active pole y the scientific and college community. In this ambit the web application can assume the role of a *Thesaurus* of the museum's content establishing infinite relations that any preserved object can establish with other cultural sectors.

Like Rosario Lopez de Prado (2000-2001) points out, Internet affects in first place the external projection of the museum that is divided in three distinct aspects:

- Advances in information access (allowing external virtual visits, object manipulation, catalogue browsing, hypertext information and links to external resources)
- Development of new marketing techniques (from advertising to products' sales) that increase the number of real visitors.
- The constant appearance of new activities that generate their own demand.

Identifying technological characteristics that favor cultural heritage communication and its enjoyment would make possible overcoming many difficulties that are part of the basis of the communicational process and would guarantee a museum the achievement of its mission through the web. For example, creating, virtual exhibits that take in consideration different needs, interests and expectations of users could lead to an offering of information and services, customized according the visitors' profile, purveying applications that fulfill educational and promotional goals.

The communicational role of the museum is included in its social function and therefore need continued evaluations in order to achieve its purpose. To refresh the communicational role of the museum it is necessary are conceptualization of its relationship with distinct groups of specific people and communities to which it aims to as well as an optimal usage of the available technological resources. Our proposal sustains that having in mind the mentioned factors we can achieve virtual exhibits of high quality, making us closer to a participative museology.

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