A Review of Museum Web Sites:
In Search of User-Centred Design

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Abstract. The introduction of the Web in museum environments is a relatively new phenomenon and the ways to utilise it are still very much under investigation. This review investigates the process of design that underlies current museum web sites and argues that it will be crucial to their future evolution and success to centre this process around the users. Based on a small-scale questionnaire of leading museum web sites it is found that the development of these sites has been a fringe activity. The museums have needed time to gain experience with the new medium and have essentially designed their sites around their own understanding of what museums are and how museum-related information can be communicated. A process of user-centred design seems a crucial next step in order to get beyond three characteristics of the current sites: (1) The majority of the museum sites have been developed without a clear notion of what the site should achieve. (2) The sites have not been evaluated to find out whether they match the users' needs and wishes. (3) The material on the sites tends to duplicate material in the physical museums rather than to rethink it given the possibilities provided by the new medium.

Keywords: Human-computer interaction, museums, usability, user-centred design, visions in design, web site management, WWW

1. Introduction

In a physical museum the collection is naturally defined by the physical co-presence of the objects. In a virtual museum on the World Wide Web this physical definition of the collection loses significance compared to other, rivalling definitions. A simple example is to define collections by the artist, irrespective of who is in possession of the artist's works. A search on the Web for 'Rembrandt Harmenszoon van Rijn' yields 33 hits with books about, catalogues on, and paintings of Rembrandt from, for instance, the British Museum, the Finnish National Gallery, Galleria degli Uffizi, and the Timken Museum of Art. To fully experience the works of art you have to go to the physical museum but for the virtual visitors it is only a secondary concern whether the picture on their screen is brought to them from this or that museum. Thus, the Web is not simply a new exhibition case for museum objects; central museum concepts such as 'the collection' are also potentially challenged.

This paper reviews current museum web sites from the point of view of user-centred design, which focuses on issues concerning the match between the computer system under construction and the use situations it is intended to support. While a number of studies describe the development of different museum web sites (see Bearman & Trant, 1997, for examples) very few studies deal with the topic of ensuring user issues a central say in the process of design. To some authors, for example Garzotto et al. (1998), usability is restricted to the question of how well users can use the functionality offered by a web site as opposed to whether the site offers the right functionality. This narrow definition of usability is essentially technology-centred in that it bypasses the issue of what the site is to achieve and merely focuses on how the available facilities are to be operated. This is unfortunate since the Web is a relatively new phenomenon and the ways to utilise it to the benefit of both the museums and their visitors are still very much under investigation. Walsh (1997), Witcomb (1997) and others argue that the Web has the potential to fundamentally change the role of museums. This is a long-term prediction but to get the direction of this process right it is essential that the interplay between the technology and the visitor experience is assigned a key role from the very beginning.

This paper includes a small-scale questionnaire survey, which provides sample data on the development process and current status of leading museum web sites (section 2). Based on this survey and on observations from a series of heuristic evaluations of museum web sites three critical issues are raised for discussion: not knowing why, failing to evaluate, and reusing rather than rethinking (section 3). Techniques to deal with these issues are also discussed.

2. Survey

A questionnaire was emailed to 30 museums selected from the *Virtual Library museums pages* on the Web (http://www.icom.org/vlmp). The selection includes all museums appearing on the list of 'Selected virtual exhibitions' and the 'Recommended additions' to this list. Three museums were excluded from the survey because their web servers did not respond. Also, the list with recommended additions contains references to other collections of museum sites. These collections were not included in the survey. The surveyed museums do not form a representative sample, rather they are examples of museums that have made an early or remarkable effort to utilise the potential of the Web—an *avantgarde*. The questionnaire and a reminder to the museums that did not answer within three weeks were submitted in March-April 1998. In response, 17 museums (57%) completed and returned the questionnaire. The responding museums are from Africa, Europe, and the United States and they are into science, history, and fine arts.

With respect to who were involved in the design of the web sites the museums gave responses such as:

> *Me originally, to push for a first for Africa; i.e., the first African museum on the WWW. I looked around the web, liked only some of what I saw, learnt to read (and write) HTML, and hacked away merrily for a couple of weeks to produce a first draft which was sent around the staff for local review.*

Four sites were developed largely by one person who had the energy to carry the project through. While some of these people were familiar with web site development others were not. The people either volunteered for the task or were selected for it because they were around, seemed capable, and had the necessary pioneering spirit. Another eight sites were also developed by the museums themselves but by teams which usually consisted of museum professionals, who were responsible for the contents, and computer department personnel, who were responsible for the actual production of the web pages. The development of these sites includes projects evolving around the material to be put on the Web (contents-driven projects) as well as projects driven by the computer-literate persons involved (technology-driven projects). The five last sites were developed in co-operation with an external computer or Internet firm. The development of these sites includes projects where the contents and design were decided upon internally and only the technical issues were handed off to the external firm as well as projects where the external firm was in charge of the entire process and the involvement of the museum was reduced to being queried about their needs and wishes.

With respect to whom the museums are addressing with their web sites, seven groupings are mentioned. Most (13) of the museums mention the general public as a primary audience of their web site. This is a very diverse user group but since several of the museums are national museums their mandate gives them a wide audience. Speaking of more specific target audiences, eleven museums mention schools and students. This reflects the educational role that many museums have but in several cases it seems as if the museums merely consider this grouping general public in need of more explanation. Five of the museums also have facilities directed at people who may never be able to physically visit the museum, for example because they live in another part of the world. These museums explicitly attempt to make the contents of their web site rich enough to be visited in its own right. Since museums are in possession of rare and distinguished objects another often-mentioned grouping of addressees is researchers, who are mentioned by five museums. Researchers have a lot in common with museum curators and are thus a rather well-understood user group. Three museums mention museum professionals from other museums as a grouping they have neglected in the first version of their site but intend to address in the next. Two additional audiences are mentioned by a single museum, namely cultural organisations and funding bodies.

With respect to how much effort the museums have put into the development of their web sites, three groupings can be discerned. Five museums spent approximately one person-month developing their web site and have since then spend 1-2 days a month on maintenance. These web sites were developed without a budget by people who had their normal work to do too. Six museums spent several person-months on the development of their site, still without a budget. This grouping contains a couple of comprehensive sites and a couple of sites that have been revised once or twice since their inception, but as illustrated by the following excerpt from one of the responses the web site is still a rather marginal task:

> *The effort that went into the creation of the site, and that now goes into its maintenance and development is essentially full-time (and overtime quite often, after hours and weekends); this makes life quite difficult, because we are all full-time in our 'real' jobs as researchers, etc.*

The six remaining museums have explicitly assigned resources to their web site by accompanying the decision to develop and maintain the site with a web site budget. There is a strong correlation between the issue of who were

involved in the development of the web sites and the effort put into the development of the sites. Four of the five sites that were developed in approximately one person-month are those developed largely by one person, and five of the six museums with a web site budget are the museums that have had an external firm develop all or part of their web site. Except for the cost of having their site connected to the Internet (the ISP cost) only one of the twelve museums that operate their site internally has mentioned that there is a budget. This museum has what corresponds to four full-time positions dedicated to the development and maintenance of the web site and additional expenses for translations and royalties. The other eleven museums that operate their web site internally seem to do so without reducing the involved persons' other responsibilities.

The final question in the questionnaire asked how well the web sites match the visitors' needs and wishes and thus concerned the feedback the museums have received on their web sites. Most of the museums get feedback by supplying an email address the visitors can write to but a few museums have supplemented this with an online questionnaire. Five museums report that the feedback has been all positive. Nine museums report that the feedback has been positive but has also contained requests for more volume (for example, more artwork and more web-based projects) as well as for changes (for example, more dynamic pages and clearer navigation). Two museums find that it is still too early to say whether their web site meets their users' needs and wishes. One museum has not answered this question. The general picture conveyed by the respondents is that though the requests for improvements should be taken seriously the feedback is primarily evidence that the basic structure and contents of the web sites is useful and usable.

3. Discussion

Looking at the museum web sites from the perspective of user-centred design, the results of the questionnaire can be summarised in two main findings:

- *No user involvement and limited user awareness*. The museum web sites are developed by people internal to the museums and by Internet firms. While these people are knowledgeable about museums and technology no mention is made of people involved, or activities undertaken, to ensure that the sites are based on a sound understanding of the issues relating to the visitors, i.e. the users and the use situations. Furthermore, the primary audience of virtually all the sites is the general public, a grouping so heterogeneous that it provides little guidance regarding the design of the site.

- *A fringe activity*. The majority of the web sites are developed by staff in periods where their 'real' work does not occupy all their time and by staff who voluntarily spend hours of their leisure time on the museum web site. Many respondents give the impression that management has not accompanied the decision to establish a web presence with active incorporation of the web site in their overall conception of the museum. Generally, the web sites are not considered exhibitions of the same importance as the exhibitions in the physical museum. Rather, many of the web sites are add-ons that provide a web presence at no or negligible cost.

The sum of these findings is not that the museums have done a bad job. The museums started as novices in web site development and several of them explicitly state that their current site was developed to gain experience with the medium. In another survey of museum web sites three out of four museums mention that the purpose of their site has shifted from marketing and promotional work toward more content-oriented issues such as greater access to the collection (Teather, 1998). In this process of redirection the present survey draws attention to a set of issues that are characteristic of the current museum sites and have severe consequences for their future evolution and success. In the following three of these consequences are discussed.

3.1 NOT KNOWING WHY

In systems development it is becoming increasingly recognised that a major reason for system failure and rejection is insufficient knowledge about the users and their needs. Eason (1988) found that only 20% of the computer systems he surveyed were successes, 40% produced a marginal gain, and as much as 40% were rejected. Some of the systems failed because they were technically poor but the most common reason for system failure was that the systems did not fit into the work situation they were supposed to support. The bad fit between the developed systems and the intended use situations stems from not knowing why the systems are made. This lack of knowledge is not total, rather the systems are based on a biased or overly simplistic understanding of who the users will be, what they will be trying to achieve, and how the changes brought about by the systems will affect the work setting.

Roughly speaking, a similar lack of knowledge is also fairly characteristic of many museum web sites. Many of the sites seem to have been built because management decided so and told somebody to develop the site without telling them what the site should achieve. This problem is not specific to museum web sites, it applies to large numbers of web sites (Nielsen, 1997). The issue is not that museums should strive to achieve something big with their web sites but that the museums should decide upon a clear purpose of their sites. Provided a museum explicitly decides not to invest in effective use of the Web, it is perfectly acceptable to make a site that is merely intended to provide the museum with an omnivisible business card.

The lack of an agreed-upon understanding of what the site is intended to achieve gives rise to two problems. First, it makes the development of the site difficult because it becomes impossible for the developers to tell what is important from what is not. This leads to disagreements among the people involved as to the focus of the site and the best utilisation of their resources, and they have very little firm grounding for resolving these disagreements. Second, and as a result, the users are not provided with any good system image (Norman, 1986) that informs them of what the site is about, how it is structured, what is in the site, and where it can be found. This kind of information should be presented in the interface in a transparent way, through how the site looks and responds to the user. Otherwise, the user will be interacting with screens, clicking on buttons and textual links, and being confronted with more screens, more buttons, and text in different formats, usually without much in the way of a scaffolding to show where one has come from, or where one is going to.

One way to work toward the creation of a coherent system image is through scenario development (Carroll, 1995). Scenarios are descriptions of use situations, that is descriptions of the users, the tasks they want to accomplish with the support of the site, and the interplay between users, tasks, and site. These descriptions can for example be made up of narratives, pictures, and extracts from visitor surveys. The quality of scenarios is that developing and agreeing upon a set of scenarios for a site is an effective tool in working with what the site is to achieve and that, once developed, the scenarios put the site into context and thus provide the developers with a richer picture of the site. This gives the developers a basis for focusing the site and starting to think in terms of visitor experiences rather than screens and navigation aids.

Paradoxically, 'not knowing why' is also a major reason for the apparent success of current museum web sites. A museum web site cannot fail until the museum formulates its intentions with the site since it only then becomes possible to determine whether or not the site lives up to expectations. If the only formulated intention is that the museum wants to be on the Web then its web site will tend to be perceived as successful by virtue of its sheer existence, unless it gives rise to massive critique. Since nobody is forced to use the site the result of bad or uninteresting design will be disuse, very few visitors will be inclined to spent time expressing their critique.

3.2 FAILING TO EVALUATE

Organisations may consider corporate image building an important purpose of their computer systems but supporting the target users in doing the things they want to do should always be a prime concern since so many systems fail to match their users' needs and end up disused or unsuccessful. User-centred design emphasises that the only way to ensure that the users will consider the developed system useful, usable, and desirable is to interact with the users throughout the development of the system. Though this may seem obvious it is seldom done. The reasons for this, discussed in Gould et al. (1991), include lack of recognition of the primacy of this issue, lack of knowledge about how to interact with users, and a belief that such interaction will increase development costs and prolong development time. In response to this state of affairs Monk et al. (1993) provide a very recommendable guide to low-cost user testing.

The surveyed museum web sites are developed by people knowledgeable about museums and technology but no mention is made of interaction with target users. Thus, the sites are shaped by professional concerns about the contents and the technology, whereas the design process has not been informed by input from the people for whom the sites are intended. The surveyed museums represent immense experience in the creation of exhibitions in physical museums but this experience does not readily apply to the design of web sites, and even in connection with physical exhibitions it is has been suggested to adopt a more user-centred approach (Fernström & Bannon, 1997). Likely reasons for the lack of user involvement in the design of the web sites include that it seemed unnecessary or overly ambitious to involve users and that the developers never got around to consider user issues because so many other aspects of the development process were unknown too.

Several of the surveyed web projects merely aimed at getting to master the technology sufficiently to put up a site with a limited amount of contents and then gain some experience with that before deciding on the next step. The effort put into these sites should not be judged by standards for the development of full-fledged systems but it is important to recognise that user issues have not been addressed and that doing so is crucial to the further development of the sites. Two museums have facilities directed at particular curriculum subjects in the national schools and one museum views the web site as a collection of sub sites targeting different audiences, but apart from that the addressees listed by the museums seem to be possible users rather than targeted users. Without carefully defining and thoroughly involving the users the development effort runs a large risk of failing for at least two reasons:

- Anchoring, i.e. the web site will end up being designed for a user who is much too similar to the designers to be representative of the actual users.

- Stereotyping, i.e. the web site will end up reflecting a view of the users that is much too homogeneous to accommodate the diversity of the actual users.

Web sites are interactive artefacts and to evaluate them it is therefore necessary to study what happens during users' interaction with the sites. This is not accomplished by encouraging the users to send their comments to the webmaster or by administering a questionnaire survey. Such self-initiated and retrospective feedback can provide information about the users' current concerns and reveal opportunities for improvement but it does not tell *how* to improve the site. Specific insights into the design of the site and the parts that must be changed because they are uninteresting, confusing, slow users down, or do not match the users' needs and ways of working can be derived from watching a small number of users as they actually use the site to perform real tasks (Nielsen, 1993). Usability evaluations like this will reveal general issues as well as details that seemed trivial until one has seen users struggle to make sense of them. Such evaluations provide developers and users alike with an intense, concrete experience of the site in use, and this has time and time again proved effective and necessary in pushing their understanding of the realities of the use situation and the possibilities of the technology.

3.3 REUSING RATHER THAN RETHINKING

New technologies provide new possibilities and impose new restrictions. Thus, the Web is different from encyclopaedias, printed newspapers, television, and museum catalogues. Consequently, good museum sites cannot be created out of contents optimised for use in, for example, a catalogue. Catalogues are inherently for linear, one-way communication so to the extent that museum sites are thought of as online catalogues they will fail to utilise the Web's possibilities for non-linearity and interactivity—and they will be inferior to printed catalogues in terms of the quality of the graphics. Most of the museum sites have been made by reusing existing material, and because resources have been scarce and the developers' knowledge about web development has been limited little has been done in the way of rethinking the presentation, structure, and contents given the possibilities and constraints of the new medium.

Such rethinking is a nontrivial matter because people's understanding of their tasks, such as developing a web site, is determined by their knowledge of available tools and, at the same time, people's understanding of their tools is determined by the tasks they will be using the tools for (Naur, 1965). Thus, people's familiarity with museum catalogues and physical museums in general shape their understanding of what museums are and how museum-related information can be communicated, and this understanding, in turn, constitutes a perspective that points to certain properties of the Web and makes people blind toward others. This makes it inherently difficult for people to transcend their current way of perceiving things and it is therefore important to support this transition process through the use of techniques that attempt to make the new possibilities visible and concrete in the context of the current task. These techniques advocate an iterative process where prototypes of selected aspects of the web site are developed to give people hands-on experience with possible designs. Such a process allows people to step by step discover (1) new possibilities to be incorporated into their understanding of what they want the web site to achieve and (2) new requirements to be incorporated into their understanding of what is possible. These techniques are directed toward users as well as developers and involve a new role for the developers, as facilitators in the creative process of envisioning the future site.

Without rethinking, the web sites will remain a secondary medium and merely duplicate material from other sources. As long as the museums treat the development of their web site as a fringe activity that can be carried out without a budget the payoffs will be slow to be realised. Since this is true for most of the surveyed museums even

though they were selected from a list of distinguished museum web sites it is, presumably, even more so for museum web sites in general. Apart from the novelty of the Web, part of the reason for this state of affairs could be that acknowledging the Web as a medium with sufficient potential to warrant tailor-made material constitutes a threat to the current distribution of power, prestige, and privileges. As long as museum web sites are appendices to the physical museums it is possible, and feasible, to delegate the responsibility for the development and operation of the web site to especially motivated individuals, the computer department, or an external firm. Granting the web sites a considerable budget and an important role in reshaping and communicating museum-related information also establishes them as a new, rivalling platform for providing individuals with a powerful and prestigious position in museums. Since the people qualified to be in charge of the web sites are normally different from the museum professionals currently in power there are often no powerful advocates for web initiatives that challenge established museum conventions. These issues, the politics of design, are a well-known source of complications and resistance to change in exhibition development (Teather, 1998; Walsh, 1997) and, more generally, in the development of computer systems (Keen, 1981).

Another reason for considering the Web a secondary medium may be that it increases the distance between the visitor and the actual museum objects. Since the origin, history, and meaning of objects frequently give rise to considerable dispute the objects themselves acquire primary importance in that the uninterpreted objects appear as the only unquestionable starting point of any attempt to make sense of things. From this point of view physical museums are superior to museum web sites because physical objects allow for a fuller and more direct perception of their nature and properties than do representations of objects on a web site. While this is a valid concern it also reflects a bias toward scholarly knowledge as opposed to for example a more context-rich approach, exemplified by cultural heritage centres, a more interactive approach, exemplified by science centres, a more aesthetic approach, exemplified by art galleries, a more contribution-inviting approach, exemplified by discussion groups, and a more socially-aware approach, exemplified by all kinds of places where people go to spend time together or meet others with like interests. Current museum web sites completely leave out the social aspect but they could potentially provide awareness of other simultaneous visitors, enable collective visits etc. Another possibility is to replace the distinction between museum web sites and physical museums with a conception that combines elements of both into one augmented museum. Individual exhibitions may involve both physical and virtual elements to provide the optimal combination of hands-on experience, access to related objects in other museums, and various kinds of background information. Furthermore, the interactive capabilities of the Web make it technically and economically feasible to design sites where the users are not merely visitors but act, explore, and contribute more actively. While numerous possibilities are available lots of experimentation is needed to find those that address real needs and to come up with usable designs.

4. Conclusion

Many museums are currently investigating how the Web can be used to bring museum information to a world-wide audience. Museum web sites are a relatively new phenomenon and the possibilities they offer as well as the constraints they impose are still in the process of being explored. In this context the present study has reviewed a selection of distinguished museum sites and found that their development has mostly been a fringe activity performed with no user involvement and limited user awareness. Among the reasons for this are that most of the museums merely aimed at getting to master the technology sufficiently to put up a site with a limited amount of contents and that the potential payoffs from involving users have not been recognised.

This review argues that with the experience the museums have gained from establishing their web site and operating it for a period of time they are now in a position where the visitor experience is becoming the essential concern. It is necessary to address this concern to get beyond three characteristics of the current museum sites:

- Not knowing why. Without a clear notion of what the site should achieve it is impossible for the developers to focus the site, and the users are not provided with any good system image to support them in picking up the structure and intention of the site.

- Failing to evaluate. Without a well-grounded understanding of the users' needs and wishes the museums will not know what is the most appropriate site to build.

- Reusing rather than rethinking. Without a commitment to develop content specifically for the web site the museums leave unexploited an opportunity to transcend their current understanding of what museums are and explore how museum-related information can be communicated.

To overcome these issues it is suggested to apply user-centred design techniques such as scenario development, usability evaluation, and iterative prototyping. These techniques contest the tendency to rush to freeze design decisions based on inadequate exploration of how tasks, users, and technology interact in constituting the use situations. Designing museum web sites around well-defined groups of users may lead to sites with less appeal to the general public, but one consequence of being universally available could be that museum web sites have to address specific groups of people to attract serious interest from anybody.

References

Bearman, D. and J. Trant (eds.), *Museums and the Web* (Pittsburgh, PA: Archives & Museum Informatics, 1997).

Carroll, J.M. (ed.), *Scenario-based design: Envisioning work and technology in system development* (New York: Wiley, 1995).

Eason, K.D., *Information technology and organisational change* (London: Taylor & Francis, 1988).

Fernström, M. and L. Bannon, "Enabling technologies for museum visitors: Issues and experiences", in D. Bearman and J. Trant (eds.), *Museums and the Web* (Pittsburgh, PA: Archives & Museum Informatics, 1997), 191-199.

Garzotto, F., M. Matera and P. Paolini, "To use or not to use? Evaluating usability of museum web sites", *Museums and the Web: An International Conference* (Pittsburgh, PA: Archives & Museum Informatics, 1998). http://www.archimuse.com/mw98/papers/garzotto/garzotto_paper.html (consulted 10 April 1999).

Gould, J.D., S.J. Boies and C Lewis, "Making usable, useful productivity-enhancing computer applications", *Communications of the ACM* 34, 1 (1991): 74-85.

Keen, P.G.W., "Information systems and organizational change", *Communications of the ACM* 24, 1 (1981): 24-33.

Monk, A., P. Wright, J. Haber and L. Davenport, *Improving your human-computer interface: A practical guide* (New York: Prentice Hall, 1993).

Naur, P., "The place of programming in a world of problems, tools, and people", *Proceedings of the IFIP Congress 65* (IFIP, 1965), 195-199.

Nielsen, J., *Usability engineering* (Boston: Academic Press, 1993).

Nielsen, J., "Top ten mistakes of web management", Jakob Nielsen's Alertbox for 15 June, 1997. http://www.useit.com/alertbox/9706b.html (consulted 13 February 1998).

Norman, D., "Cognitive engineering", in D. Norman and S. Draper (eds.), *User Centered System Design: New Perspectives on HCI* (New Jersey: Erlbaum, 1986), 31-61.

Teather, L., "A museum is a museum is a museum… or is it?: Exploring museology and the web", *Museums and the Web: An International Conference* (Pittsburgh, PA: Archives & Museum Informatics, 1998). http://www.archimuse.com/mw98/papers/teather/teather_paper.html (consulted 10 April 1999).

Walsh, P., "The web and the unassailable voice", *Archives and Museum Informatics: Cultural Heritage Informatics Quarterly* 11, 2 (1997): 77-85.

Witcomb, A., "The end of the mausoleum: Museums in the age of electronic communication", in D. Bearman and J. Trant (eds.), *Museums and the Web* (Pittsburgh, PA: Archives & Museum Informatics, 1997), 143-150.