Museums of the Future Symposium

Interaction Design Centre
University of Limerick
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Introduction

Museums, cultural heritage centres and the like use computers to enhance the visitor experience and to make information about the museum and samples from the collection accessible world-wide via the Internet. The new possibilities brought about by using computers in museums are still under investigation and have recently led to some discussion as to what constitutes a museum.

The idea of the Museums of the Future Symposium was to bring together people with different backgrounds to discuss issues surrounding the use of IT in museums today and in the future. The main aim of the symposium was to stir interest, and identify people and concerns to be followed up subsequently. Museum curators, multimedia designers, researchers, museum visitors and others involved need input from people on different sides of the debate.

The topics of the symposium included:

- enhancing the visitor experience
- what is the role of museums?
- what is the role of multimedia within specific exhibitions?
- how should museum objects be packaged?
- views on exploratorium type centres
- ergonomics of IT use in public spaces
- social interaction in museums
- the concept of the 'virtual museum'
- reports from specific projects and studies

Program

09h30-10h15	Registration
10h15-10h30	Introductory Remarks, Liam J. Bannon
10h30-11h30	Multimedia in Museums, Mark Leslie
11h30-12h00	Coffee
12h00-13h00	Museums of the Future, John Hunt
13h00-14h30	Lunch
14h30-16h00	Videos, presentations, and work groups
	A Review of Museum Web Sites, Morten Hertzum
	STORY, Marial Hannon
	Social Interaction in Museums, Dirk vom Lehn
	Hunt Museum Web Site, Keith Doran
	Lack of Speed Kills Your Business, Mikael Fernström
16h00-16h30	Coffee
16h30-17h30	Wrap up, mediated by Liam J. Bannon

Introductory Remarks:
Towards the Museum of the Future?

Liam J. Bannon
Director
Interaction Design Centre
University of Limerick

On behalf of the University of Limerick Interaction Design Centre, I am very pleased to open this Symposium on Museums of the Future. The purpose of the meeting is to assist in the creation of a forum for discussion among a variety of actors - museum curators, educationalists, designers, architects, multimedia developers, museum visitors, etc. concerning the changing role of Museums in our society, and the possibilities offered by virtual environments and interactive information technologies. Here at the Interaction Design Centre, we are involved in researching new forms of interaction between people and technology, paying attention to the demands of particular use situations and employing what we term a "use-centred" approach. The latter emphasises the need for rapid prototyping and formative evaluation, in order that "end-users" can obtain concrete experience of the future use situation and be able to react to the draft designs. We are involved in a number of on-going European and national research projects where our expertise in analysing user requirements, use of a variety of observational study methods, concept design, prototyping skills and evaluation techniques are utilised.

In the context of this Symposium, the Interaction Design Centre has a number of interests. We have been involved as consultants in developing the requirements and detailing the specification of the audio-visual and interactive multimedia installations at the new National Museum in Dublin. This work involved collaboration with different interest groups, concept development, consideration of the overall "visitor experience", as well as more general ergonomic issues concerning visitor traffic around the exhibits. We have been closely involved with the Hunt Museum here in Limerick in exploring ways of using information technology in the museum, and have assisted in the creation of a Web site for the museum. Student projects are involved in exploring the use of virtual reality software on this site. One of our group works as a docent in the museum, thus providing a strong link to the practical concerns of the staff in the museum. We expect that this linkage will be developed further over the coming years. We have also been investigating Museum and Art Centres on the Web, concentrating on both the motives behind the development of the Web sites, and the evaluation of these sites on a number of dimensions, concerning their aesthetics, usability, interest, etc. The Centre has also been working with the STORY project at Bunratty Castle and Folk Park. In consultation with Marial Hannon of Shannon Heritage, the STORY creator and developer, we are collaborating on ways in which to move the STORY project - concerning object histories in local communities - on-line. Again, some of our students have been developed prototypes exploring new interfaces to this material. We are also developing a number of scenarios of future use, concerning the evolution of Internet-based discussion among communities concerning the existing STORY corpus, using a variety of collaborative software applications. The Centre is also involved, through the Performing Arts Lab at the University, with developments in Media Arts more generally, for example we have developed a new technology-based performance medium - LiteFoot, a working prototype of an electronic dance floor. We see significant opportunities for developing variants of this technology to enhance visitor experiences in "exploratorium"-type science and technology museums and centres.

During the course of the day, many of the IDC-involved projects mentioned above will be explicated further, and if people wish additional information, they can contact us directly. However, the purpose of the symposium is not simply to provide a showcase for our work, but, as I noted earlier, to open up discussion about the changing nature of Museums - brought about by changes in economic, social and cultural policies, by changing visitor requirements and interests, and by the availability of new information technologies. While our focus in mainly on the potential role of information technology in

Museums in this particular symposium, one cannot address this issue in isolation from the more general questions of curator concerns, visitor interest, and government funding policies.

With this mind, it is a great pleasure to have our two guest speakers, John Hunt and Mark Leslie, with us for the symposium, as they are both intimately involved in Museum work, and present us with somewhat different perspectives on the relation between Museums and information technology, a perfect starting point for what we hope will be a lively debate that will continue and lead to further interdisciplinary meetings in the future. Enjoy!

Multimedia in Museums

Mark Leslie

Martello Multimedia

Computer based multimedia has not come to replace the book, but to civilise television by replacing passive viewing with user interactive participation.

The benefits of using computer based, digital multimedia displays for educational purposes in public exhibition spaces are fivefold:

- *Multimedia* provides a dynamic mix of text, images, and sounds.
- *Digital Media* can store vast amounts of data in compact portable manner.
- *Global Networking* permits dynamic two-way communication.
- *Interactivity* offers learning by doing, rather than viewing.
- *Enhanced Interfaces* allow much more than screen interaction.

Multimedia

Multimedia offers a multiple media environment for bringing exhibitions to life combining the best features of the book, television, and the computer game. These include text, spoken narrative, still and moving images, computer animation, and three-dimensional virtual reality. Past and future landscapes can be recreated photo realistically using computer modelling and photo montage. Changes through time can be shown dynamically.

Digital Media

Because digital media can store vast amounts of data compactly, it can provide in-depth labelling systems to support traditional exhibition displays, objects, models and tableaux, without using up valuable floor space. Unlike wall displays and traditional linear audio-visual presentations, computer files can be continuously updated and modified. They can even become useful means of gathering data from visitors. Displays can be multi-lingual and information can be layered to cope with different levels of interest and comprehension. Hypertext automates the task of indexing and cross-referencing.

Global Networking

Global networks are rapidly developing the capacity to allow simultaneously two-way transmission of broad-band audio-visual data. This will effectively allow every computer screen to become both a multimedia broadcasting, and receiving station. The transition from broadcast media to networked multimedia is equivalent to the change from railways to the motorcar. It will democratise every aspect of communication, marketing, and education. Real-time two-way link-ups can be provided with people, places, and events anywhere in the world and beyond. Exhibition touch screens can be configured with filtered internet connections that permit access to relevant web sites, or search for pre-selected themes and topics but do not allow visitors to surf freely.

Interactivity

Computers are tools. Research has established that increasingly both adults and children approach computer displays with the attitude “What can I do with this machine?” and not “What is this screen

going to tell me?" Exhibition visitors expect pace, dynamism, and the insight that comes from active role playing. A screen crammed with text and static images will not grab the limited attention span of visitors in a space full of other enticing exhibits. The mental involvement of problem solving explains a new generation's addiction to role playing computer games. Whilst we can retain only 20% of what we hear or read, and 50% of what we see, we retain 70% of what we work out for ourselves, in an interactive role playing environment.

Enhanced Interfaces

A unique opportunity for visitor attractions is to exploit a wide range of new computer/human interface technologies including touch floors and wall panels, virtual reality head sets, head up displays, DVD digital projection equipment, and heat and motion detectors to create large-scale interactive experiences. These can vary from dance floors where the sound and light show is controlled by the dancer's feet, to video karokee stages where visitors can use 'air guitars' to jam with their favourite rock group, to 'art walls' that visitors can 'paint' with their hand and feet, to interactive adventure mazes. Motion simulators can provide visitors with compelling illusions of driving everything from Victorian steam engines to galactic space crafts.

Museums of the Future

John Hunt

We are often told that the future of Museums lies with the use of new technology. I don't know for sure but I suspect it is a bit of a red herring. It is a bit like hearing the one that the future of museums is purely dependant on more money being made available. For me the appropriate question is the simple one: "What will museums be like in the future?" It is only after this question has been posed that we can go on to ask questions about the role of technology within that future. But we must also ask questions about the national responsibility to its heritage, security, audiences and, indeed, entertainment.

Museums have always been concerned with technology. They exist to display manifestations of technology throughout the ages. A bronze-age axe, like a second generation computer, is designed to do the same job as its predecessor: however its improved technology means it does the job better. Museums have always used technology, and have always sought to improve and develop those technologies that make their lives easier in many areas such as security, admissions control, environmental control and conservation.

The big issue, therefore, is how do we use modern technology to maximum effect so that our museum becomes a better museum? Technology is, after all, only a tool and should never become its own justification.

Imagination

Einstein said that "Imagination is more important than knowledge". In many ways this could be declared the unofficial motto of The Hunt Museum. Take, for example, the Museum's approach to labelling objects in the collection.

The earliest museums had no labels at all. They were cabinets of curiosity which served as starting points for scholarly discussion. Because those who either owned or had access to such collections were well educated there was little need for instructive labels. Labels for individual objects really only came in with the Victorians. The idea being that the uneducated masses could receive some information and instruction about what they were looking at. Ever since then things have got out of hand as far as object labelling is concerned. We have now got to the stage where some museum visitors spend more time looking at the label than at the object itself. And I wouldn't be at all surprised that the same holds true in some museums where computer terminals are available.

In The Hunt we deliberately decided to have a certain number of rooms which would be label-free zones. We saw it as a way of challenging the visitor to look more closely at the object in an attempt to figure out what it might be. And if the visitor does want information they can always approach one of the Museum docents. In a little over a year these areas of the museum have proved immensely popular. Informal feedback would suggest that visitors find that the absence of a label helps remove a feeling that they should learn while they are in a museum, and that it enables a more relaxed approach to looking at individual objects. It has certainly lead to an increase in noise levels in those rooms, as visitors do less reading and more discussing about the material in front of them. By removing the feeling to acquire Knowledge, we have enabled the Imagination to run riot!

Expectations

My father worked on the excavations of a Neolithic site at Loch Gur, Co. Limerick, during the 1940's. Every few weeks the Director of the National Museum would come down to inspect the excavation's progress and to monitor the finds. As an exercise in studying the pottery making process, my father and some of the archaeology students had made a replica Neolithic pot which they then broke to see how

they would manage to reconstruct the shards. When they heard that the Director of the National Museum was about to visit the site, the opportunity for a bit of mischief was too good and the broken pot was placed on the table alongside the real finds for his inspection. Although he was one of the most respected archaeologists of his generation, the Director of the National Museum was taken in by the fake pot and proceeded to lecture the students about how this discovery gave the site much more importance than it had enjoyed so far.

The point I am making is that, in this case Imagination was more eagerly applied than Knowledge! The gentleman justified what he saw to fulfil his expectations. Which is why the display in The Hunt Museum deliberately seeks to be non-museum in style. There is no heed paid to chronology. No particular story is told. Objects are placed side-by-side in an apparently random manner. And all with the deliberate intention of subverting and challenging the visitors' expectations.

Money

Money will never be the solution to figuring out what the museum of the future should be like. Like the application of technology, money is only a tool that can be used if you have figured out in what direction you are going.

The Custom House was refurbished and made ready for the Hunt Collection for roughly IR3 million, whereas some IR30 million was required for the refurbishment of Collins Barracks for the National Museum. Though some have tried to 'wind me up' over this apparent disparity, I have yet to rise to the bait. As far as I am concerned the National Museum should be getting something closer to IR300 million. And besides, extra cash would not necessarily have made The Hunt a better museum. What makes The Hunt work as a museum is that we knew the character of the museum we wanted long before we started to talk about budgets. A case of Imagination being more important than Cash.

The Museum of the Future

The Museum of the Future will need to be different and to have its own character. It will also need to know what exactly it is trying to achieve...in the context of its own unique collection. Only then can they begin to figure out what technology may or may not be appropriate to support that vision.

The Hunt Museum

I believe that the reason The Hunt works as a modern Museum is that it has defined its own identity which, though different to most museums, is appropriate to the Collection it houses. The Hunt Collection is not a National Collection: it therefore has none of the baggage that normally goes with national responsibility. It is a finite collection of some 2,000 pieces assembled by two individuals: in this sense it is more an accumulation than a collection. There is no pressure on the Museum to tell a chronological story or fill 'gaps' in its collection. The Museum is held in trust for the people of Ireland. And therefore accepts a responsibility to its ownership. The display is different in that it seeks to convey a domestic ambience rather than that of a public building. Hence there is much emphasis on daylight, carpets and 'furniture-style' display cases and drawers.

The Hunt is different from most museums in Ireland in that it charges admission. This was a conscious decision in that the museum is not there to offer the ultimate solution to leisure time: instead we are merely offering another option. In this regard we are deliberate in avoiding the message that 'This museum is good for you and will improve your mind'.

Conclusion

And that is the key to it all: that the Museum of the Future does not necessarily have to be good for you.

And this is the danger with technology in museums. All too often technology has been installed in museums in an effort to win back those of us who were put off culture for life thanks to forced museum visits when at school. The real way to win back the museum audience is to provide a well thought out

experience that is relevant to and respectful of an audience that is much better educated and that has much higher expectations than those of a previous generation.

As I said above, technology only becomes relevant when a museum knows exactly what it is trying to achieve. Once its vision is clear technology is a wonderful tool that is only beginning to be exploited to its potential. In the overall scheme of things technology in the Museum of the Future should enhance Knowledge and stimulate the Imagination.

A Review of Museum Web Sites: The Next Step is Use-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 use-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 tend 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, use-centred design, Web, 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 the museums 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, the National Gallery of Victoria, 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 takes as its starting point that museum web sites are products of a design process and assesses this process from the point of view of use-centred design. Use-centred design 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. 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), Whitcomb (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 empirical 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 the surveyed 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 which consisted of four questions:

1. Who were involved in the design of the web site, that is were the decisions about how to focus, arrange, and develop the web site influenced by, for example, a consultant, the curators, management, a single knowledgeable person, the visitors? Who was in charge?
2. Who are you addressing, that is have you directed the web site toward specific groups of people such as children, teachers, researchers, or the general public?
3. How much effort went into the development of the web site, that is how big was—and is—the budget and the number of person months spent?
4. Based on the feedback you have got, does the web site match the visitors' needs and wishes? What do they particularly like and miss?

The responding museums are from Africa, Europe, and the United States; they are into science, history, and fine arts; and they are a mix of physical museums with a web presence and virtual-only museums.

2.1 Results

The first question, *Who were involved in the design of the web site?*, yielded responses such as (the citations are excerpts only, not the respondents' full answer to the question):

> Excerpt 1.1. *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.*
>
> Excerpt 1.2. *The decision to create a web site for the museum came from the management level. The responsibility was given to the programmers in the Computer Department. The initial creation was by three staff: [their names]; none had previous experience in html or web design.*
>
> Excerpt 1.3. *The current design was initiated by the Director of the museum. A working group consisting of members of the IT section, marketing division, multimedia and design professionals put together the requirements for the site design and navigation and then the project was handed to a multimedia company for redesign.*

With respect to who were involved in the design of the web sites, the museums make up three groupings, see Table 1. 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 (techie-driven projects). The five last sites were developed in cooperation with an external computer or Internet firm. The development of these sites includes projects where the contents and design were decided 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.

Table 1. Who were involved in the design of the web sites?

Category	No. of museums
Largely a one-man's effort (but now being opened to others)	4 (24%)
Internal contents specialists and internal computer/Internet specialists	8 (47%)
Internal contents specialists and an external computer/Internet firm	5 (29%)
Total	17

The second question, *Who are you addressing?*, yielded responses such as (the citations are excerpts only):

Excerpt 2.1. *Our target audience: everybody!*

Excerpt 2.2. *We are mainly addressing the general public of the museum. The site will make them curious of our museum and hopefully make them visit us.*

Excerpt 2.3. *A section of the site, not yet completed, is targeted at school teachers and students in the [National] School System.*

Excerpt 2.4. *The overall site is geared to the general public, while specific subsites will be of interest to targeted groups. For example, a page listing Museum library resources would be helpful to researchers. […] Thought was given to the worldwide audience who may never be able to physically visit the Museum. Those visitors can explore the permanent collection, complete with audio commentaries.*

Table 2. Who are the museum web sites addressing? (only 15 museums answered this question)

Category	No. of museums
General public/potential visitors	13 (87%)
Schools and students	11 (73%)
Virtual-only visitors	5 (33%)
Researchers	5 (33%)
Museum professionals	3 (20%)
Cultural organisations	1 (7%)
Funding bodies	1 (7%)

Note: Most museum web sites address more than one category of visitors.

With respect to whom the museums are addressing with their web sites, seven groupings are mentioned, see Table 2. Almost all 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. However, quite a few museums seem to address the general public in an attempt to attract new groups of visitors to the physical museum. Speaking of more specific target audiences, the most frequently mentioned is 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 will not visit the physical museum, for example because they live in another part of the world. This includes the two virtual-only museums but also three physical museums that 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. Researchers have a lot in common with the 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.

The third question, *How much effort went into the development of the web site?*, yielded responses such as (the citations are excerpts only):

> Excerpt 3.1. *No budget then or now… It took around one man-month. We spend 1.5 days a month updating.*
>
> Excerpt 3.2. *Since I'm normally the animal keeper of [the museum], I haven't got that much time for the web site, so the development of the site is a bit slow.*
>
> Excerpt 3.3. *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. There was no budget for the web site, and we all worked on it on our museum time.*
>
> Excerpt 3.4. *There has not been, until now, a proper management approach to the site. It has grown like an academic site, not a commercial one.*
>
> Excerpt 3.5. *In round numbers, total budget was in the range of USD 140,000. This does not include the time spent by museum curators and others.*

Table 3. How much effort went into the development of the museum web sites?

Category	No. of museums
One person-month of development and 1-2 days a month of maintenance, no budget	5 (29%)
Several person-months of development and maintenance, no budget	6 (35%)
Several person-months of development and maintenance, a budget	6 (35%)
Total	17

With respect to how much effort the museums have put into the development of their web sites, three groupings can be discerned, see Table 3. 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. Finally, six 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 question 1 on the people involved in the development of the web sites and question 3 on 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 fourth question, *Does the web site match the visitors' needs and wishes?*, yielded responses such as (the citations are excerpts only):

> Excerpt 4.1. *The response to our site has been very positive. Of particular interest are the research papers and graphics.*
>
> Excerpt 4.2. *The results of the survey indicate that people seem very happy to visit our site. The main complaint is about the number of artworks: people claim for more images.*
>
> Excerpt 4.3. *They like it, but want MORE which we can't give with no budget.*

With respect to the feedback the museums have received on their web sites, the users' reactions have been very positive, see Table 4. 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 have been all positive. Nine museums report that the feedback have been positive but have also contained requests for more volume (for example, more art work 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.

Table 4. Do the web sites match the visitors' needs and wishes? (only 16 museums answered this question)

Category	No. of museums
All positive	5 (31%)
Positive but also requests for changes and more volume	9 (56%)
Too early to say	2 (13%)
Total	16

3. Discussion

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

- *No user involvement and limited user awareness*. The museum web sites are developed by people internal to the museums and, in some cases, computer/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 very 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. Though the decision to establish a web presence has often come from management many respondents give the impression that management has not accompanied this decision by active backup and the incorporation of the web site in their overall conception of the museum. Generally, the web sites are not considered exhibitions of the same status and 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.
- *Primarily positive feedback from the users*. Apart from two museums that consider it too early to say whether their web site meets their users' needs and wishes the museums report that the reaction of users to their web sites has been very positive. Certainly, the users express wishes for more online contents, more dynamic pages and things like that but the general picture conveyed by the

respondents is that though these wishes should be taken seriously they are also evidence that the basic structure and contents of the web sites is useful and usable.

The sum of the 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 note that their current site was developed to gain experience with the medium. All the surveyed museums have learned tremendously from developing their web site, maintaining it, and gradually getting to conceive it as an available resource. The findings are, on the contrary, intended to draw 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 system development it is becoming increasingly recognised that a major reason for system failure and rejection is insufficient knowledge about the users and their needs (see, e.g., Gould, 1988; Nielsen, 1993). Eason (1988) found that only 20% of the 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 entire 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 the director or another executive 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 active use of the Web, it is perfectly acceptable to make a site with a small amount of information about the museum, how to reach it, and what is currently on display. This is not the most effective use of the Web but will serve the purpose of providing the museum with a business card that is visible world-wide.

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 is impossible for the developers to differentiate between what is important and 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 user is not provided with any good system image (Norman, 1986) that informs him/her 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 bad publicity or 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. The museums naturally welcome the positive feedback they get but since they are not dependent upon virtual visitors many museums are not truly motivated to attract them.

3.2 Failing to evaluate

The ultimate purpose of building computer systems, including museum web sites, is for them to support people in doing the things they want to do. Organisations may consider corporate image building another important purpose but knowing the target users and their work situation should always be a prime concern since so many systems fail to match their users' needs and end up disused or unsuccessful. Use-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 widespread lack of recognition of the primacy of this issue, widespread lack of knowledge about how to interact with the users, and a widespread belief that interacting with the users will increase development costs and prolong development time. In response to this state of affairs Monk et al. (1993) provide one of several practical guides to low-cost user testing.

The museum web sites are a case in point. They are developed by people knowledgeable about museums and technology and 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 exhibitions in physical museums it is has been suggested to adopt a more use-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 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. The limited awareness of user issues is also apparent in the tendency to address broad and weakly defined audiences such as the general public. 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 groups of people, 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. despite the designers' efforts the system 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 system 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 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. Whether performed in the laboratory or the field 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 mutual learning about the realities of the use situation and the possibilities of the technology. Users' self-initiated feedback and retrospective statements collected with, for example, questionnaires can raise some issues but they embrace neither the interactive aspects nor the mutual learning and should not be confused with usability evaluation.

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 due to the load time and poorer 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 have been limited little has been done in the way of rethinking the presentation, structure, and contents given the properties and possibilities 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. Such 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 and allow them to step by step discover new possibilities to be incorporated into their understanding of what they want the web site to achieve and new requirements to be incorporated into their understanding of what is possible. These techniques are directed toward both users and developers and involve a new role for the developers, as facilitators in the creative process of envisioning the future site.

Current museum web sites leave out the social aspect that is often an integral part of visits to physical museums. To make virtual visits a fuller experience museum web sites could potentially provide awareness of other simultaneous visitors, enable collective visits, and host discussion groups where visitors can 'meet' other people with like interests. Another issue is to replace the distinction between museum web sites and physical museums with a conception that combines elements of both into one augmented museum. Virtual exhibitions should not necessarily have a physical counterpart but could instead be available in the physical museum as multimedia installations that provide access to the web site. Indeed, 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 information and background material. 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. This provides opportunities for a dialogue that evolves around the user's interests and information need rather than follows a predefined guided tour. While numerous possibilities are available lots of experimentation is needed to find those that address real needs and to come up with usable designs.

Without rethinking, the web sites will remain a secondary medium which merely duplicates 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.

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 from the point of view that they are products of a design process. It is found that the development of most of the sites is a fringe activity performed with no user involvement and limited user awareness. Among the reasons for this are that several 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 will fail to explore the opportunity to transcend their current understanding of what museums are and how museum related information can be communicated.

To overcome these issues it is suggested to apply use-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.

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STORY

Marial Hannon

Bunratty Folk Park

The STORY project is orchestrated from the Bunratty Folk Park but the black boxes that constitute the collection are produced by children from Ireland, the rest of Europe, and beyond. Most of the black boxes are produced by pupils in the late stages of primary school. The children explore an aspect of their local heritage such as 'baking', 'fire', or 'the plough' by interviewing old people in their community. Often these people are the children's grandparents and the interviews consist of granny telling a story about everyday life 50-60 years ago. The children document the story by producing a black box with text, drawings, photos, and a collage.

Currently the completed boxes are kept at Bunratty Folk Park but with the steadily increasing number of boxes this is becoming an obstacle to the continued evolution of the project. Taking the boxes away from the local community is also somewhat at odds with the project's focus on the importance of the local aspects of history and cultural heritage. Therefore, the people involved in the STORY project are looking at the possibilities of receiving the boxes, copying them onto some other media, and then redistributing the boxes back to the local communities. In the local communities, the black boxes could, for example, form a permanent - and growing - exhibition at the local school or library. Currently the boxes are available at Bunratty Folk Park, and an annual 'STORY day' at Bunratty celebrates the project. But as the project grows beyond the borders of Ireland more and more of the children who have contributed a story will never get the opportunity to see the collection and have a look at some of the other black boxes.

Copying the stories onto CDROM or some other electronic media would render it possible to make the entire collection available to the children who have contributed a story, and to other interested parties. A CDROM pack could be included when the black box was redistributed back to the collectors, or it could be made available over the Internet. Getting access to the entire collection, rather than to individual boxes, would make it possible to start exploring activities such as 'baking' across a variety of cultures. In this sense the STORY collection constitutes an evolving encyclopaedia of local, grounded definitions of everyday objects and activities. The STORY has just begun.

(this summary was written by Morten Hertzum on the basis of Marial Hannon's talk)

Social Interaction in Museums

Dirk vom Lehn

King's College London

Research studies on visitor behaviour in museums and galleries to a large extent have considered the 'visitor' as an individual who explores exhibitions individually by encountering single exhibits. Thus, the 'museum experience' has been studied as if visitors would not be influenced by the copresence of other visitors.

This talk explores how the 'museum experience' is fundamentally influenced by social interaction among visitors. Based on ethnographic field work and video recordings inside museums, galleries and science centres it investigates the following questions:

- how do visitors approach exhibits?
- how do visitors negotiate access to exhibits?
- how do visitors negotiate co-participation in activities at and with exhibits?
- how do visitors 'collaboratively' interact with exhibits?

With the study of visitor behaviour in exhibitions we intend to cover issues that contribute to the academic discourse on social interaction and the meaning of objects, as well as those for museum practitioners who are involved in the design of exhibits and exhibitions.

The academic discourse in the social sciences currently oscillates between a neglect of the artefact in social interaction and a perspective that considers artefacts as active 'participants' in social interaction. Through the detailed analysis of video recordings we want to contribute to this debate and elaborate an account of the meaning of artefacts for the social organisation of interaction.

Studies on visitor behaviour are predominated by two perspectives, the behaviourist approach and the cognitivist approach that both consider museum exhibitions as pre-set contexts in which visitors experience exhibitions. Through this research project we want to develop a concept that draws on the findings of both approaches. But by applying recent findings in the social sciences, we intend to develop a 'third way' to understand visitor behaviour as socially organised interaction mediated through objects.

Hunt Museum Web Site

Keith Doran

University of Limerick

Keith Doran demonstrated the web site prototype he has developed for the Hunt Museum.

The primary aim of designing the prototype has been to produce an interesting, interactive web-site. Included in the web-site is a ‘virtual museum’, which allows the user to walk around virtual galleries and walk up and inspect artefacts for themselves. This is done using a language called VRML (Virtual Reality Modelling Language). Also included in the site is a ‘Quick-Time Object Movie’ of one of the museum’s most precious artefacts, Leonardo da Vinci’s Bronze horse. This allows users to view the artefact rotating on a base in the form of a movie. The web-site is created mainly using HTML. There is also some use of Java in the site.

Lack of Speed Kills Your Business

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Introduction

This paper concerns variations in Internet infra-structure and Internet use that can affect a business, or organisation, that wants to make efficient use the Internet/World Wide Web for delivery of information or services. Initially, it might appear as if it did not matter where in the world you locate a web-server in relation to your users or markets. The Internet is supposed to be global, interconnecting everything with everybody. As many Internet users might have observed, download times are getting longer and longer and surprisingly enough, no improvements seem to be gained by buying faster modems or communication lines for connections to their Internet Service Provider (ISP). To understand some of the issues involved, we will have to take a brief look at the different links involved:

- Throughput of Server
- Server's Connection
- Internet itself
- User's Connection
- Speed of User's Browser

Apart from "soft" issues like web page design and the amount of graphics or multimedia content, one or several of the factors above can be bottlenecks. Further more, unlike the bottleneck metaphor, the speed of the Internet can vary depending if you are accessing it from the "inside" or the "outside," i.e. if you are surfing for local or international content and from where you are accessing the information.

Server Side

First, the computing power of a server determines how much information it can deliver per second, and indirectly how many "hits" (users requesting information) per second it can deal with. Assuming that we have a server with sufficient computing power, our next potential bottleneck is the connection to a network, most often a Local Area Network segment that in turn is connected via a gateway to the Internet, directly or indirectly. Network interface card (NIC) are often 10BASE-T or 100BASE-T, that theoretically can give you a throughput of 10 or 100 Mbps[1]. This means that a screenful of data (e.g. graphics) with average quality (640 x 480 pixels in 256 colours = 307,200 bytes ≈ 3 Mbits[2]) will take either 0.3 or 0.03 seconds to send to one single user. If, for example, 100 users requested the same amount of information to be sent to them at roughly the same time, the NIC would limit the speed and the whole delivery of bits will take almost 31 seconds. Depending on what server software that is used and the nature of the transaction, this means that either all the users will receive their information slower or some users will get their information first and the others will have to wait.

User Side

On the user's side of an Internet connection there are several possible bottlenecks. First of all, a modem, or network interface card, with a specific data rate. Secondarily, the computing power and browser type will affect the performance. Assuming that the user has sufficient computing power and a suitable

[1] Mega bits per second, 10^6 bits per second.
[2] Throughout this paper it is assumed that it takes, on average, 10 bits to send a byte, to cater for the overhead in communication protocols.

browser, we can then look at the modem. If we are receiving a screenful of information, it is approximately 3 Mbits. The resulting download times will then be around 107 seconds for a 28.8 kbps modem, or 48 seconds if you have an ISDN line[3].

The Internet and ISPs

The US Internet backbone currently runs at 622 Mbps. This might seem to be a nice and convenient data rate, but no individual user will ever get to enjoy the "full blast". Users connect through service providers, ISPs, with different levels of quality and speed.

The situation in Ireland is, to use a mild expression, much slower. The following table illustrates the speeds that users have to share, using the backbones of Irish ISPs.

Service Provider	**Speed (Mbps)**	**link to...**
Ireland On-Line	5.5	US
Indigo	3	US & UK
ESAT	2 3	Europe US
HEAnet	34 2 6	Europe JANET (UK) US

On a more local level, as for example the University of Limerick, speed is even lower than this. The university web-server, ULiX, is connected via a 2 Mbps link to Dublin, and due to priority routing by the HEA node the university will only get 1 Mbps of international traffic. The implication of figures as outlined above is that there is really no point putting up interesting content on Irish servers, as the information will rapidly suffocate in an increased number of requests. To illustrate this problem, the following table outlines the download time we get with our previously mentioned screenful of information.

Backbone Connection Speed	Number of simultaneous users	minutes	seconds
1.5	100	3	25
3.0	100	1	42
5.5	100	0	56
1.5	1000	34	8
3.0	1000	17	4
5.5	1000	9	19

It is quite obvious that normal users will not wait longer than less than a minute for information to download. With a load as outlined above, most users' browsers will timeout and report that the server is not available. A user surfing within Ireland might not get the same problem as the Irish ISPs have established the so called Internet Neutral Exchange (INEX) to keep Irish traffic within the country through peering, i.e. the rate at what see things from the "inside" might be very different from the "outside".

[3] A normal ISDN line provides 64k in one direction and 64k in the other. In addition to this you have a third channel with 16k capacity.

Conclusion

The quality of the Irish infrastructure is severely lagging behind European and US standards, while both universities and companies are trying to use the "new" technology. At the same time, for information or service owners that want to use the Internet, the only working strategy is to find and ISP that can provide a connection outside the Irish infrastructure, and possibly also locate a server (or shared server space) outside Ireland. There are several ways to investigate the speed and quality of connections, from the "outside", even if you are "inside". For example www.mids.org are running a server in the US that will *traceroute* any other server on the Internet, hence you can investigate the quality of a potential ISP before you make any critical decisions. Alternatively, you can simply ask a friend or colleague abroad to surf in and report what download times, errors, etc., that occurred.

Sources

Matrix Information and Directory Services, Inc., http://www.mids.org/

JANET, the UK academic and research network, http://www.ja.net/

Darenet, the Danish academic and research network, http://www.darenet.dk/

Sunet, the Swedish academic and research network, http://www.sunet.se/

ESAT Telecom, http://www.esat.ie/

Ireland On-Line, http://www.iol.ie/

Indigo, http://www.indigo.ie/

Telecom Erieann, http://www.tinet.ie/

Higher Education Authority network, http://www.heanet.ie/

General Discussion

Irish web sites on American servers

To get around the bandwidth problem Colm McGettrick puts up web sites with Irish contents but on servers in the United States. This can be done so that the user won't even notice that the server is not located in Ireland.

The '.ie' part of the domain name is allowed for any Irish entity. That is, it relates to the contents of the site, not to where the server is located. If you buy your own domain name the site can even be moved later (when the bandwidth into Ireland is eventually increased) without any consequences on the part of the user. The user will not even be able to tell that the site has been moved.

Operating a site in another country is not complicated. It involves just two applications (you can use other applications than the ones mentioned, but Colm McGettrick uses these two):

- WS_FTP to copy files to the server (this application is also useful if you operate a local site)
- Telnet to control the site.

Museums as communities

Brendan Bolger brought up the community aspect. Can museums be extended to become communities, or provide a forum, for friends of a museum?

John Hunt replied that discussion groups was one way to try and support the building of such communities. In connection with the Hunt Museum he wanted to see the discussion groups grow from the docents' work. The docents could write papers or give talks and these contributions could be communicated and extended through the discussion groups. Occasionally a researcher or a student could write a paper or give a talk.

A couple of student projects at the University of Limerick have explored the possibilities of providing visitors of web sites with information about other simultaneous visitors. This could enable the development of social practices around the use of the Web. Users could be provided with a chat area for brief encounters, they could exchange email addresses if they wanted to stay in touch for a longer period of time, and with cheap technology such as web cameras they could get in instant visual contact. Thus, the technology could be used to support the creation of communities of people who are geographically dispersed but have like interests.

Social interaction in museums

In relation to Dirk vom Lehn's presentation Mark Leslie noted that apart from showing how people behave in museums the videos also showed the importance of the design of the hardware that surrounds exhibits. Does it allow for collaborative viewing? Does it accommodate both children and adults? Does it allow for privacy to watch/solve a puzzle? …

Also in relation to Dirk vom Lehn's presentation John Hunt drew a parallel between studies of visitor flow in museums and commercial studies of customer flow in supermarkets. When the Hunt Museum opened they had a lady from customer care in SuperQuinn give a talk to the docents. She provided much useful advice, for example with respect to making people feel welcome, feel that their contributions are appreciated etc.

The differences among museums

Mark Leslie emphasised the differences among museums. On the one hand, the Hunt Museum which has the collection, size, and nature that allow the museum to give primacy to the objects themselves. On the other hand, the STORY Project which in its extended form - when the objects are redistributed back

to the collectors - becomes an omni-museum. An omni-museum being a museum that is everywhere and nowhere. The Hunt Museum is a place you go to look at exciting and distinguished objects; the STORY Project stimulates people to collect objects and stories themselves. National museums is yet another category of museums, local heritage centres a fourth, and so on.

In its current form the STORY Project is more about the collection of stories and the creation of the black boxes than about looking at the completed boxes. One of the major challenges ahead is to devise ways to visualise and benefit from connections between different story boxes. The use of CDROMs and the Web is not just an attempt to reach the growing number of collectors who live outside Ireland but also an attempt to design an exhibition that lives up to the collection process.

Virtual museums

Mark Leslie noted that physical museums as we know them (the Victorian museum) are themselves a very virtual thing as the objects are removed from their context and put into exhibition cases with little labels attached to them. It is hard to say whether computer-based virtual museums are any more virtual than current, physical museums.

Mark Leslie noted that there exists several construction kits for museum IT.

Getting away from the box

Several noted that computer systems in museums easily get in the way, are located away from the objects, and distract the visitors' experience of the objects. Liam Bannon noted that part of this problem is brought about by an almost total absence of hardware design to accompany the software design. You do not expect a telephone, washing machine, car radio,… to look like a computer even though they have a computer inside. So why are nearly all computer systems for enhancing museum exhibitions a traditional pc running some museum application? Hardware design is utterly needed to develop museum exhibitions where the computer-enhancement of the visitor experience is integrated with the visitors' experience of the actual objects.

One local example of a design that involves both software and hardware is Litefoot, the electronic floor produced at the University of Limerick to record a dancer's steps, produce music with your feet, and play with the relations between movement and sound.

Appendix: Pointers to a small selection of museum web sites

The pointers are by no means a representative sample, they are intended for inspiration only. Each museum web site is described by its name, its address on the World Wide Web, and a one-line comment. A much larger collection of museum web site is the Virtual Library Museums Pages (VLmp) which can be found at http:/www.icom.org/vlmp.

Château de Versailles (near Paris, France)

http://www.chateauversailles.fr/en

In addition to the samples from the museum collection this site contains a rather large amount of background information about Louis XIV and other key people.

Exploratorium (San Francisco, US)

http://www.exploratorium.edu/

An exploratorium type site that provides projects to do and things to explore, rather than objects to look at. Awarded *best web site* at the Museum and the Web Conference in 1997.

EXPO Ticket Office (virtual only)

http://sunsite.unc.edu/expo/ticket_office.html

The world's very first web exhibit. While the contents is great the shuttle bus metaphor used to package it is pretty ridiculous.

Fredrikstad Museum (Fredrikstad, Norway)

http://www.hiof.no/fredrikstad-museum

This site about the Norwegian town Fredrikstad has a nice local touch but many visitors will be disappointed to find that it is in Norwegian only.

Interactive Museum of Turkey

http://www.m2.org

A virtual museum that provides one common access point to objects from a range of Turkish museums.

Lin Hsin Hsin Art Museum

http://www.lhham.com.sg/

Lin Hsin Hsin is a Singapore-based artist whose works incorporate images, sculptures, poetry and music. Her museum shows snippets of her work.

National Gallery of Art (Washington DC, US)

http://www.nga.gov/

A huge site with lots of contents and a very nice graphic design.

Natural History Museum (London, UK)

http://www.nhm.ac.uk/

A site intended to promote the discovery, understanding, responsible use, and enjoyment of the natural world.

The Louisiana Museum of Modern Art (north of Copenhagen, Denmark)

http://www.louisiana.dk/english1.html

A site nicely focused on the museum's calendar of events.

The Virtual Museum of Computing (virtual only)

http://www.comlab.ox.ac.uk/archive/other/museums/computing.html

This site is a valuable resource but stretches the museum concept by merely providing links to other sites that exhibit objects and information about computing.