

Draft version

Challenges and opportunities faced by cultural heritage professionals in designing interactive exhibits

Fiona McDermott, Interaction Design Centre, Dept. of Computer Science and Information Systems,
University of Limerick

Loraine Clarke, Dept. of Computer and Information Science, University of Strathclyde

Dr. Eva Hornecker, Faculty of Media, Bauhaus-Universität Weimar and Dept. of Computer and
Information Science, University of Strathclyde

Dr. Gabriela Avram, Interaction Design Centre, Dept. of Computer Science and Information Systems,
University of Limerick

Contact person: Fiona.McDermott@ul.ie

<http://www.mesch-project.eu>

Abstract: Petrelli et al. (2013) propose a movement that would empower curators, artists and designers in the creation, installation, maintenance and alteration of exhibits that are meant to bring materiality and physical interaction to the forefront of visitors' experience, while simultaneously expressing the values of the cultural institution. While many cultural heritage professionals would welcome this ability to create and integrate interactive exhibits into the design of exhibitions, for the majority there is a significant technical knowledge gap and the tools required to create these exhibits are still out of reach. In order to understand what methods and technologies could be suitable, we first need to ascertain the existing challenges and opportunities faced by cultural heritage professionals in designing interactive exhibits. The research focuses specifically on the working perspective of cultural heritage professionals, complementing existing studies on the design and implementation of interactive exhibits at cultural heritage sites.

Based on interviews with professionals from a range of cultural heritage institutions across Europe, we investigate the existing curatorial practices, revealing the challenges faced when creating interactive exhibits, as well as the difficulties in relation to access, authorship, participation, creativity and control of such exhibits. We examine two aspects of the cultural heritage professionals' work practices in relation to interactive exhibits: 1) the attitudes and perspectives of curators and designers highlighting the values, goals and aspirations that are considered when creating exhibitions, and 2) current resources and methods used to create and implement interactive digital exhibits indicating the advantages and disadvantages of these.

In conclusion, we outline the potential avenues that we are currently investigating that could aid cultural heritage professionals in the design and development of interactive exhibits. We discuss design implications to be considered in the creation of a hardware and software platform that would allow these professionals to bridge this knowledge gap.

Keywords: interactive exhibits, exhibition design, cultural heritage professionals, digital media, curatorial challenges

Introduction

Within museum and cultural heritage research there is a large body of work focusing on the visitor experience, behaviours and educational goals. However, few studies focus on the design process of interactive exhibits highlighting the failures of these exhibits (Parry 2010). The approach various museums, cultural sites and designers apply when creating interactive media is rarely discussed. Previous literature suggests that simply because we have the ability to use technology in museum exhibits, this does not mean we should be, indicating the presence of challenges around exactly what to do and how to implement the growing body of affordable technology resources available into desirable interactive exhibits (Bell 2002). This research aims to highlight what these challenges are and how they are dealt within the cultural heritage sector.

In terms of prior research that focuses on existing design practices when creating interactive museum installations, the Exploratorium has been largely acknowledged for its novel in-house trial and error

design approach, spending 80 percent on research and development and 20 percent on the construction of an installation (Caulton 1998). Their process involves collaborative discussions throughout the process with people of various expertises (ibid.). However, other museums tend not to carry out prototyping during early stage exhibition development, especially using technology, as it is often out of the realms of their in-house resources and funding and requires external expertise (ibid.) despite the recognised benefits.

There are recognised challenges when creating interactive exhibits, such as the struggle to create installations that consider technology thoughtfully in order to open up "*new connections for museum visitors*" (Bell 2002; Thomas & Mintz 1998). Furthermore, the challenges may be based mostly around the audience expectations and the quality of the experience (Parry 2010). Keeping up to date with the rapid rate of technology on offer and with user expectations is another significant challenge faced by museums and cultural heritage centres (Thomas & Mintz 1998).

Interactive exhibits can be disappointing for visitors due to factors such as confusing or lack of feedback, broken installations, usability problems, and confusing mapping of controls (Allen & Gutwill 2004, Bitgood 1991, Gammon 2009). These problems can stem from fundamental conceptual flaws, lack of formative evaluation and poor consideration of the maintenance and upkeep requirements.

Because of the lack of research specific to the interactive and digital design practice of cultural heritage professionals (CHP), we believe that questioning contemporary CHP on their attitudes towards and approaches to the design and implementation interactive exhibits is vital if we are to imagine a movement whereby curators and related professionals self-create, install, maintain and alter digital interactive exhibits. We strive to answer these questions in order to specifically understand CHP as potential users of technology that will aid them in the design of interactive exhibits.

In this paper, we describe an interview-based study with CHP and analyse two areas in relation to the design of interactive exhibits: 1) the attitudes and perspectives of curators and designers highlighting the motivations, expectations and aspirations that are considered when creating exhibitions, and 2) current resources and working methods used to create and implement interactive digital exhibits. In conclusion, we discuss some of the design implications to be considered in the creation of a hardware and software platform that would allow these professionals to bridge this knowledge gap.

Study setup

The study has been conducted as part of a larger research investigation into contemporary curatorial practice within the context of the Material Encounters with Digital Cultural Heritage (meSch) project.¹ The overall objective of this study is to gain an understanding of the working methods of CHP in designing exhibitions and to establish what their key values are in designing interactive exhibitions. As part of the interviews, we questioned interviewees on a broad range of issues concerning exhibition-making, including design methods, co-operative relationships and technology.

The research explores a number of questions such as: What are the working methods of the CHP? Who is the main author in the planning and design of the exhibition? What are the challenges faced by CHP in translating concepts in the design of interactive exhibits? What technologies and environments are CHP familiar with? What are the motivations and expectations of CHP when in integrating technology into exhibitions?

Methodology

Semi-structured interviews were conducted with CHP who have worked on the planning of specific exhibitions. The majority of interviews took place at the participants' working environment and most were on a one-to-one basis, although there was an occasion where two of the authors conducted a two-on-two interview with two professionals from the same cultural heritage institution. The interviews lasted between 40 and 90 minutes. The participants were encouraged to speak about a particular exhibition that they had helped to design. All of the cases concerned original exhibition designs - bar one case - which was an adaptation of a previous exhibition. The majority of those interviewed were

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long-term employees or members of the institution while a small number of the interviewees were on short-term contracts.

In total, we interviewed 16 CHP from 14 different cultural heritage institutions across Europe – eight from Ireland, three from the Netherlands, two from the UK, two from Germany and one from Italy. The participants had a variety of educational backgrounds and worked in different roles of their respective organizations, including curation, education, management, digital media and research. We aimed to sample a variety of museum types, the institution types include science and technology, local history, national museums, literary and archaeological collections.

Depending on the size of the institution, the resources available vary, ranging from institutions with a small number of staff - where staff members typically have multiple roles - to large institutions with dedicated technical staff. For the purpose of this study, we distinguish three types of institutions (see Table 1):

- *Museums with five or less members of staff* – small museums with a restricted number of staff. Individual members of staff will typically have multiple roles, i.e. management and curation.
- *Museums with between five and fifty members of staff* – medium sized museums.
- *Museums with 50 or more members of staff* – large museums where staff typically have dedicated roles and sometimes multiple staff have a similar role, i.e. applied arts curator, fine arts curator etc.

For each of the CHP we interviewed, we noted their experience with the design of digital interactive exhibitions and identified three user groups (see Table 1):

- *Individuals who organise regular digital interactive exhibitions.*
- *Individuals with experience of commissioning one-off digital interactive exhibitions.*
- *Individuals with no experience of designing digital interactive exhibitions.*

For the purpose of this study, we will first focus on the first and second groups. The experience of the third group will also be discussed in order to highlight the challenges they must overcome if they are to design digital interactive exhibits in the future.

Participants	Interviewee role in the museum	Museum size	Country	Type of museum	Experience with designing interactive exhibitions
P1& P2	Deputy Director & ICT Manager	50 +	Netherlands	Science & Technology	Organises regular digital interactive exhibitions
P3	Digital Media Curator	5 - 50	UK	Science & Technology	Organises regular digital interactive exhibitions
P4	Exhibition Researcher	5 - 50	Ireland	Science & Technology	Organises regular interactive digital exhibitions
P5	Manager	5 - 50	Ireland	Science & Technology	Organises regular interactive digital exhibitions
P6	Assistant to Director	>5	Germany	Literary	No experience of designing digital interactive exhibitions, interested
P7	Curator	>5	Ireland	City Museum	No experience of designing digital interactive exhibitions, interested
P8	Curator	50 +	UK	National Museum	No experience of designing digital interactive exhibitions, <i>no interest</i>
P9	Curator	>5	Ireland	City Museum	Experience of commissioning one-off digital interactive exhibition. Interested
P10	Archival Assistant	>5	Ireland	City Museum	No experience of designing digital interactive exhibitions, interested
P11	Head of Education	>5	Ireland	History	Experience of commissioning one-off digital interactive exhibition. Interested
P12	Manager	>5	Germany	Literary / Historic house	No experience of designing digital interactive exhibitions, interested
P13	Manager	>5	Ireland	Literary	No experience of designing digital interactive exhibitions, interested
P14	Curator	5 - 50	Netherlands	Archaeology	Organises regular digital interactive exhibitions
P15	Curator	5 - 50	Italy	History	Experience of commissioning one-off digital interactive exhibition. Interested
P16	Exhibition Coordinator	>5	Ireland	History	No experience of designing digital interactive exhibitions, interested

Table 1. Interview participants

Findings

The findings section is divided into two parts, reflecting the two research objectives. Firstly, we discuss the attitudes and perspectives of curators and designers, highlighting the values and aspirations that are considered when creating exhibitions. Secondly, we discuss the current working methods, design approaches and resources used to create and implement interactive digital exhibits, indicating their advantages and disadvantages.

1. Attitudes and perspectives

Regardless of whether the CHP interviewed had regular experience of designing digital interactive exhibits, experience of commissioning one-off digital interactive exhibitions, or no experience of designing digital interactive exhibitions, each of the interviewees - bar one case - expressed a strong interest in incorporating digital interactive exhibits into their museum exhibitions. However, barriers of technical knowledge and ability persist.

I think it's tremendous what it [technology] can do; I think it's because I don't understand it well that I get nervous or frightened of it. But I think it's really important that it advances more and more into exhibitions and interpreting exhibitions. (P16)

In some cases, the CHP has an advanced appreciation for and understanding of the potential of digital interactive exhibits, recognising that they could be used to accommodate multiple visitors, to illustrate multiple narratives and to allow for the incorporation of dynamic content, which is immediate and updatable.

I would like to ... update that specific exhibit environment as a result of the timeline and have those data feeds come through to the exhibit environment as immediate information, whether it be apps or games or competitions or challenges around that. (P5)

I would be interested in going down the road of multi-touch gesture table. The content we deal with here would suit a surface environment very well and it would be suitable for the amount of visitors. (P5)

To use technologies to show different perspectives and to make the visitor more involved for example through personal stories. (P15)

However, the interviews also illustrated that some CHP have limited expectations of what form digital interactive exhibits can take and what they can achieve. Some are of the opinion that digital interactive exhibits are unable to replicate the real life qualities of objects.

I'll always be an advocate for the physical, I wouldn't just want interactive screens. The older objects have a soul, you can feel the history of them. (P10)

And of course these are the details, the weight, the feel that can't be translated into a digital format. (P8)

There are several strong motivations for integrating technology into exhibitions. For the smaller museums, the desire to include digital exhibits was driven by the perceived visitor expectation of being up-to-date. Evidence exists that the CHP also refer to other museums and exhibition ideas and see the inclusion of new interactive exhibitions as important for attracting and maintaining audiences. For one of the interviewees, the ability to generate publicity based on high-tech exhibits was an important factor.

Having new technology based exhibits, if anything, provides us with a great press release and gets visitors through the doors. (P9)

If we are perceived of as an organisation that is continually turning out new ideas, new exhibitions and that we are doing things that different museums would shy away from then it's a different proposition altogether. (P9)

Another reoccurring motivation in using technology is the desire to communicate invisible material or to subtly augment the original sense of place so as to make visitors more aware of their surroundings.

Keeping away from taking from the essence of this place by using smart tech to develop the sensor lead data ... So it would be great to make this content visible so as to show the connectivity and changes dynamically and in a more responsive manner. (P5)

Despite these positive attitudes towards the potential of incorporating technology into museum exhibits, a common attitude that persists is that the inclusion of digital interactive exhibits may result in unintended and undesired outcomes such as the distraction of visitors.

It's one of those things, I don't want too many sparkly things because the show is the exhibition, I don't want to be upstaged by anything extra. (P9)

However, another interviewee acknowledged that it is possible to have digital interactive exhibits that don't result in distraction.

From my experience I thought this is really technology that I like... Because it's focusing on the object... It's technology that's helping you, it's one-to-one, and it's not distractive. (P14)

These findings demonstrate that there is a general overarching interest amongst the CHP in the incorporation of digital interactive exhibits into their exhibitions but there is a conflict in terms of understanding what is achievable with digital interactive exhibits. In addition, the interviews revealed a number of advantages and disadvantages connected to the use of technology ranging from positive expectations, i.e. helping to being seen as an up-to-date institution and being able to communicate intangible content to somewhat negative expectations, i.e. the fear of been upstaged by technical exhibits.

2. Working methods, design approach and resources

Of the five interviews with institutions that regularly design and organise digital interactive exhibitions, three stated that they conceive of the exhibitions in-house and then involve external exhibition designers on the design, development and implementation. All of the museums maintained a close involvement with exhibition designers during the design process. But in the cases of P1, P2 and P3, the detail of the interpretation plans were particularly pronounced, whereby the interviewees defined the desired learning outcomes not only in terms of knowledge or skills, but also in terms of values and attitudes and in categories that relate to user experience, such as inspiration and enjoyment. In the case of P1 and P2, interpretation plans are continuously adjusted as the designs develop, ensuring that the exhibit remains coherent with the curators' aims. P4 stated that they adopted an alternative approach to the design and organisation of digital interactive exhibitions, exhibition concepts being conceived by a 'guest' curator and then individual interactive exhibitions being commissioned in accordance with the exhibition concept. This is a noted alternative team approach which is gaining popularity (Smithsonian Institution). In this case - and in contrast to P1, P2 and P3 - there is little dialogue between the museum and commissioned exhibition designers, and the work of designing exhibitions is not continuous.

They generally take people on based on their speciality, then they work on an exhibition for X amount of months and then they will probably not work on another exhibition. (P4)

Medium to large museums are more likely to, on occasion, build exhibitions collaboratively through a project consortium, an approach that P1 and P2 identified as becoming an increasingly common amongst science and technology museums. These types of 'shared' exhibitions come about through either of two approaches: either a specific exhibition is collectively designed and developed by a consortium of museum partners as experienced by P1 and P2, or an exhibition is designed and developed by a single museum and then repackaged for use at different museums as experienced by P4.

It is worth noting that only one of the interviewees stated that they have had formal training in exhibition design. In terms of skills and expertise in technology and digital media, there was a vast spectrum of knowledge amongst the interviewees. Generally, the skills and resources in these areas were higher in the science and technology-related museums, whereby a high number of staff would have a background in technology or science. One of the science museums also had a university research facility in the same building, that would aid the museum staff in the design and development of applications for the museum.

We would be proficient in designing robotic systems and the software interfaces that drive these systems. We are very lucky with the team we have in that they can code and devise any needed systems. (P5)

The same interviewee also expressed an interest in testing and prototyping digital interactive exhibits.

I would like the ability to test and create all of these variations of media types. (P5)

On the other end of this knowledge spectrum, there are CHP who lack technical expertise and who would therefore find it difficult to imagine what is possible to achieve in terms of digital exhibits.

The problem is it's difficult for us to imagine what technology could do. We need some suggestions. (P15)

Indeed the need for inspiration in terms of coming up with ideas for exhibitions was also suggested by a number of the interviewees who said that they tend to refer to other exhibitions for ideas.

I always look at other exhibitions for inspiration...it [the other exhibition] was just such a sumptuous experience, you walk into it, it was very beautifully done. (P8)

Common barriers for the interviewees against the inclusion of digital interactive exhibitions were lack of budget, lack of time and lack of human resources. For those interviewed with no experience of

designing digital interactive exhibitions, there was a perception that the cost would have been too high. For example, one of the interviewees commented;

Yes, I would have liked to have seen technology play a larger role in the exhibition, but we didn't have the budget. I would have liked to have worked further with sounds, smells especially for younger audiences. (P10)

The implication that some digital interactive exhibits aren't built robustly enough to handle constant use was also encountered. Another interviewee with no experience of designing digital interactive exhibitions commented on the basis of her experience as a visitor:

Technology I find takes a lot of money and in most museums I've been to, if you go into the interactive area where the children have been, most of the machines are out of order so you need to have somebody constantly on site to maintain the technology. (P7)

In contrast, the experience of an interviewee who regularly designs digital interactive exhibitions is that while maintenance of interactive exhibits is required, they have the necessary resources to deal with it:

[We have] an in-house AV team that works on small prototyping and maintenance of interactive exhibits. The more interactive exhibits you have, the more maintenance required. (P1 & P2)

For smaller museums, however, the lack of human resources can be a problem:

As a museum, I would like to see us using more media, our problem is our structure I don't think we are set up for it. If you want it done properly I think you should have someone 24 hours. (P9)

In summary within our interview pool, there was a wide variety of working methods, design approaches, and organisational structures, depending on the institution. Formal training in exhibition design was the exception whilst the level of knowledge, skills and resources in digital media differed greatly, some institutions demonstrated an advanced level of technical expertise and expressed an interest in prototyping ideas where another institution with little technical expertise stated that they would struggle to picture what could be achievable with technology.

Conclusion/discussion

The findings illustrate the desire to use technology and an awareness of the advantages interactive exhibits could bring such as accommodating multiple users, appearing up to date in order to attract audiences, as well as the ability to communicate dynamic and intangible data. While the potential advantage of interactive exhibits in focusing the attention of the visitor onto an artefact was demonstrated, the results also highlighted several disadvantages of digital interactive exhibits as perceived by CHP, including high costs, maintenance issues, timely design and distraction to visitors. Another concern that emerged was the inability to translate real life qualities of objects, possibly losing the elements of authenticity that Petrelli et al (2013) linked to valued material qualities of artefacts.

Reflecting on the findings and previous research there appears to be a lack of attention to initial and formative evaluation of interactive technologies, often a result of limited resources. Drawing from HCI design practices, there are numerous design methods, in particular user centred design and participatory design that could address the challenges faced by CHP. However, the findings highlight that when questioning the design process of CHP we must also consider the limitations in terms of resources that museums face, as is particularly the case for small museums.

The challenges experienced by some CHP at a conceptual level could be attributed to a lack of awareness of interactional possibilities that the vast array of new technologies hold (Thomas & Mintz 1998) as well as the inability to test out these concepts. This challenge could be addressed through the current DIY maker and digital fabrication (Fablab) movement which focuses on making low costs, rapid prototyping highly accessible to the general public, as it could help curators and designers to develop interactive exhibits. Enabling CHPs to gain a greater understanding of the interactional capabilities of technology, based on exploration of ideas through prototypes that examine potential users' interactions, behaviours and responses using hardware such as Microsoft.net gadgeteer² and

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<http://www.netmf.com/gadgeteer/>

Arduino.³ We are currently exploring how these methods and low cost technologies used in the maker and DIY movement for prototyping and exploration of ideas could assist CHP in gaining a deeper understanding of the potential interactions and interactive installations that could be achieved with technology.

As part of the meSch project, we are working towards the design of an authoring environment to be used by CHP for the creation of tangible smart exhibits. Considering the tendency for CHP to refer to other exhibitions for ideas and inspiration for their own exhibits combined with this general lack of awareness of interactional possibilities for exhibitions, there is a strong argument for the inclusion of a community platform as part of the authoring environment. This community platform could allow CHP to share their experiences of designing exhibits, to upload video instructions detailing how they created their exhibit and to exchange examples and templates for the creation of exhibits.

Open Exhibits⁴ offers a similar community of practice and collection of software aimed specifically at developing interactive digital exhibits in-house at museums. The initiative is representative of the currently changing approach to integrating and supporting technology in museums and it emphasises that with a better understanding of the problems, challenges, practices and expectations of CHP, we can provide practical solutions so as to support CHP in delivering and maintaining digital interactive exhibits in a more effective way than is currently being carried out.

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References

- Allen, S. and Gutwill, A. (2004) Designing with Multiple Interactives: Five Common Pitfalls. *Curator: The Museum Journal*, 47 (2), 199-212.
- Bell, G. (2002) "Making sense of museums: The museum as 'cultural ecology':A Study", CIMI Whitepaper, Intel Corporation
- Bitgood, S. (1991) Suggested Guidelines for Designing Interactive Exhibits, *Visitor Behavior Journal*, VI (4), 4-11.
- Caulton, T. (1998) *Hands-on Exhibitions: Managing Interactive Museums and Science Centres*, Routledge, London
- Gammon, B. (2008) 'Everything We Currently Know About Making Visitor-Friendly Mechanical Interactive Exhibits' in *The Informal Learning Review* available at www.informallearning.com/archive/1999-1112-a.htm
- Parry, R.(ed.) (2010) *Museums in a Digital Age*, Leicester Readers in Museum Studies, Routledge, London
- Petrelli, D., Ciolfi, L., van Dijk, D., Hornecker, E., Not, E., Schmidt, A. (2013) "Integrating material and digital: a new way for cultural heritage", *interactions* Vol.20, Issue 4 (July 2013), pp 58-63.
- Office of Policy and Analysis (2002) *The Making of Exhibitions: Purpose, Structure, Roles and Process*, Washington, DC: Smithsonian Institution, Office of Policy and Analysis. P 21
- Available at: (<http://www.si.edu/Content/opanda/docs/Rpts2002/02.10.MakingExhibitions.Final.pdf>)
- Thomas, S., Mintz, A. (1998) *The Virtual and the Real- Media in the Museum*, American Association of Museums.
- Villar, N., Scott, J., and Hodges, S. (2010) "Prototyping with microsoft .net gadgeteer", *Proceedings of the fifth international conference on Tangible, embedded, and embodied interaction (TEI '11)*, ACM, New York, NY, USA, pp.377-380.
- Zampelis, D., Gill, S., Loudon, G., Walker, D. (2012) "Augmented Reality Centered Rapid Prototyping" *Proceedings of HCI 2012*, The 26th BCS Conference on Human Computer Interaction, Birmingham, UK, 12 - 14 September 2012 online at

³ <http://www.arduino.cc/>

⁴ <http://openexhibits.org/>

<http://ewic.bcs.org/content/ConWebDoc/48853> last retrieved at 14 Oct 2013.