



## King's Research Portal

### *Document Version*

Early version, also known as pre-print

[Link to publication record in King's Research Portal](#)

### *Citation for published version (APA):*

vom Lehn, D., & Heath, C. (2005). Accounting for new technology in museum exhibitions. *International Journal of Arts Management*, 7(3), 11 - 21. [n/a].

### **Citing this paper**

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

### **General rights**

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

### **Take down policy**

If you believe that this document breaches copyright please contact [librarypure@kcl.ac.uk](mailto:librarypure@kcl.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.

## **Accounting for New Technology in Museum Exhibitions**

Dirk vom Lehn

&

Christian Heath

King's College London

Research paper

To appear in

2005

International Journal of Arts Management

Vol. 7(3): pp.11-21

### Authors:

Dr Dirk vom Lehn is Research Fellow in the Work, Interaction & Technology Research Group (WIT) at the Management Centre, King's College London.

Professor Christian Heath is Professor of Work, Interaction and Technology and director of the WIT Research Group.

### Contact

Work, Interaction & Technology

Research Group

The Management Centre

King's College London

Franklin-Wilkins Building

150 Stamford Street

London SE1 9NN

Tel. +44 (0)20 78484314

Fax. +44 (0)20 78484479

{dirk.vom\_lehn; Christian.heath}@kcl.ac.uk

## **Abstract**

Museums of fine and decorative art increasingly deploy computer-based interpretation devices such as Personal Digital Assistants and information kiosks into their exhibitions. Museum managers hope that such new technology will help raise visitor numbers, attract new audiences and enhance visitors' experience of exhibits. Yet, we have relatively little knowledge of whether the investment in digital resources 'pays off' for museums. Conventional accounting methods and techniques largely assess whether investment in exhibitions leads to higher visitor numbers and increased revenue, but ignores the museum's agenda and mission. Studies of visitor behavior and learning primarily focus on whether visitors attend to exhibits but largely lack methods to examine the quality of the museum experience. This paper wishes to contribute to current debates about the adequacy of methods favored in financial accounting and visitor studies for the assessment of investment in new technology in museum exhibitions. It draws on two cases to explore how the deployment of PDAs and information kiosks influences the ways in which visitors examine and experience the exhibits. The findings are used to assess the deployment of new technology in exhibitions, to provide practical information to managers and designers who plan and develop such technologies for art museums and to show how ethnographic and video-based methods can contribute to current practice in museum accounting.

**Keywords:** museums, interpretation, new technology, accounting, visitor studies

## **Introduction**

There is a growing interest in exploring the ways in which new technologies can enhance participation in museums and galleries. The long-standing commitment to interactivity in science museums and science centers has begun to bear upon developments in the arts and decorative arts. It is increasingly recognized that carefully designed new technologies may provide visitors with relevant and tailored information and serve to enhance interpretation of and engagement with object rich collections. In this regard, we have witnessed, for example, the deployment of digital displays alongside works of art, the development of mobile technologies for visitors to contemporary art galleries, and the introduction of a range of ‘low tech’ interactives into leading art and decorative art museums. There remains however some debate as to the usefulness of these resources, their contribution to aesthetics and aesthetic experience, and their ability to actually facilitate participation and engagement.

The deployment of these new, interpretative resources also raises a familiar issue for those involved in museums and galleries, namely how can you assess their value for money and contribution. Research in public sector management and accounting increasingly criticize the use of conventional, financial accounting methods that assess whether museums offer “value for money” (Landry 1994; Wu 2003) and argue for the development of new methods and techniques that help assess the quality of exhibitions. These discussions correspond to long-standing debates within the social sciences and the distinction between quantitative and qualitative methods; debates that resonate within the literature on museum studies and in particular the analysis of visitor behavior and interaction (Falk et al. 2000; Hein 1998).

In this paper, we wish to briefly explore the ways in which new interpretative resources are used by visitors within museums and galleries. In particular, we will focus on two specific examples, the first involving the deployment of Personal Digital Assistants (PDAs) within a contemporary art gallery, the second touch-screen based information kiosks in a leading decorative art museum. In addressing these two cases we wish to point to the ways in which the resources have a profound impact on the behavior of visitors and their ability to explore and discuss exhibits in collaboration with each other. We also wish to suggest that certain approaches in the social

sciences, in particular field observation and video-analysis, provide resources to enable us to begin to unpack the qualities of interaction that arise with and around exhibits in museums and galleries.

## **New Technology in Museums**

The growing interest in new technology amongst museum managers has been reflected in the deployment of multimedia devices in art exhibitions. These devices are viewed to be of critical importance to enhance the museums' role as educational institutions. They are used to support the interpretation of exhibits and to increase the appeal of museums to the public. Recent technological developments have encouraged some managers of art museums to deploy novel interpretation devices in their exhibitions, in particular PDAs and touch-screen computers. Researchers and practitioners are exploring how these devices can be designed to increase the time visitors spend with exhibits, to provide visitors with additional information and to facilitate social interaction and discussion between visitors (Aoki et al. 2002; Exploratorium 2001; Fleck et al. 2002; Spasojevic et al. 2001; Woodruff et al. 2001).

The growing importance of new technology for the design of exhibitions has occasioned debates about whether its deployment in exhibitions offers value for money. In recent years, the suitability of conventional accounting practices and financial indicators for the assessment of the accountability of museums has increasingly been questioned. Scholars in public sector management and cognate disciplines argue that museum accounting needs to take seriously qualitative features of the museum's mission, such as visitors' learning from exhibits and the museum's agenda for social inclusion and diversity (Carnegie et al. 2003; Carnegie et al. 1996; Matarasso 1997; Rentschler 1998; Thompson 1999, 2001).

In museum studies there is a long-standing interest in the study of visitor behavior and learning in museums. Research in this field largely draws on the behavioral and cognitive sciences. It strives to assess the effectiveness of exhibits in attracting and holding visitors and in communicating information to them. The evaluation of exhibits and exhibitions largely relies on quantitative indicators; "stopping power", the average number of visitors stopping at an exhibit, "dwell-time", the average time visitors spend at an exhibit, and "communication power", the effectiveness of an

exhibit in delivering information to the visitors (cf. Serrell 1998; Shettel 2001). It has been concerned also with how interpretation devices like labels, touch-screen information kiosks and PDAs can help enhance the effectiveness of exhibits. They explore issues such as: Do more visitors stop at an exhibit equipped with an information kiosk? Do visitors spend more time at an exhibit when they use a PDA or read a label? Do visitors understand information delivered by such devices? and Do visitors talk and interact with another when using these devices? Evaluations of different kinds of interpretation device show that visitors spend considerably more time at exhibits when using them and appear to engage frequently in social interaction and discussion with each other (Exploratorium 2001; Keene 1998; Schulze 2001; Screven 1991; Serrell et al. 1992). Yet, relatively little is known of whether the extended involvement in activities at exhibits contribute to the quality of visitors' experience of the museum.

In visitor studies there is a growing concern with the development of methods and techniques to assess the quality of visitors' experience of museums (Falk & Dierking 2000; Hein 1998). Research increasingly draws on the cognitive and educational sciences that have developed an interest in the way in which social interaction and talk impact on people's learning and understanding (Lave et al. 1991; Wenger 1999; Wertsch 1991). It investigates how social interaction and talk impact the quality of visitors' experience of exhibits and exhibitions (Debenedetti 2003; Goulding 2000; Leinhardt et al. 2002; McManus 1994). Despite their interest in social aspects of the museum experience these researchers largely focus on the individual visitor and strive to assess their experience and learning from the museum. They also show relatively little interest in how interpretation resources like labels feature in social interaction and talk amongst visitors (for a rare exception see, McManus 1989).

However, a growing number of researchers in visitor studies have begun to use qualitative ethnographic and video-based methods that are concerned with the ways in which people experience and make sense of exhibits in and through social interaction. They demonstrate that social interaction is critical for visitors' experience of exhibits. They also have begun to explore how visitors use labels when examining artwork (Heath et al. in press-a; Hensel 1987; Leichter et al. 1989; vom Lehn et al. 2001). The methodological and analytical framework that these investigations have employed,

provide us with important resources to investigate how visitors engage with digital interpretation devices when interacting with each other in museums. They offer access to the ways in which visitors examine and make sense of original artwork when using interpretation resources. Thus, they can support our understanding of how new technologies in exhibitions influence the quality of the museum experience.

This paper explores how ethnographic and video-based research methods can contribute to our understanding of the impact of new technology on visitors' experience of exhibits and exhibitions. It draws on two case-studies that explore how visitors use a touch-screen information system deployed in the Victoria and Albert Museum (London) and a PDA in a museum of modern art. The observations and findings provide the basis for an assessment of the contribution qualitative research methods can make to accounting practice in museums. They also are used to develop a number of sensitivities for the design of novel interpretation devices to be deployed in museums of fine and decorative art.

## **Mobility and Collaboration**

Our first case study is based on an experiment run by a contemporary art museum in London that deployed PDAs in one of its thematic galleries. PDAs are portable devices with a small screen that display information and can be used to make selections by virtue of a touch-screen interface. They can deliver multimedia content, text and images as well as sound and video-files. The visual content appears on the screen whilst the audio-information is delivered via headphones.

The gallery where the technology was deployed is comprised of fourteen rooms that house different kinds of exhibits; paintings and photographs as well as sculptures. As part of the experiment set up by the museum, the PDAs delivered information about one exhibit for each of the fourteen rooms of the gallery. The purpose of this design was to cover a variety of objects, paintings, sculptures, collages, etc., and to provide visitors with different kinds of content for the exhibits. Visitors picked up a PDA at the information desk and then explored the gallery. For approximately four weeks we observed visitors in the gallery and video-recorded approximately twenty visitors who volunteered to take part in the experiment. Our interest in the PDA is neither with its functionality or usability nor with the user's satisfaction with it, but rather with how

the use of the PDA features in and influences visitors' examination and experience of the exhibits.

### Displacing the Object

Visitors who choose to use the PDA when navigating the exhibition carry the device in their hand and wear headphones. As they enter the first room they wait for the device to display information about an exhibit. They turn towards and stand at this artifact for the duration of the information delivery.

Consider the following brief examples:

In the first room, the PDA provides information about a sculpture. The audio-commentary is concerned with the artist and the period of his work. It also mentions a few aspects of the exhibit like the artist's signature on one side of the sculpture. A man enters the room. He waits for the information about one of the exhibits to be displayed by the PDA and then turns to the sculpture. He stands at the side closest to the entrance of the gallery and looks at the screen. After about twenty seconds he looks up and moves slightly to the side to briefly glance at the signature. He then turns again to look at the device and walks around the sculpture.

In a second room, the PDA gives information about a painting. It describes certain features of the artwork highlighted by an image on the PDAs screen. The information is designed to encourage the viewer to look at those specific exhibit features. A woman using the PDA adopts a position at the painting. She listens to the information whilst looking at the screen. When the image highlights a particular exhibit feature she briefly looks up at the artwork. A moment later, she once again orients to the screen until the screen highlights another exhibit feature.

Despite the mobility of PDAs visitors largely use them in stationary positions near the exhibits covered by the information. They tend to choose a center-position at the exhibit where they can view the artifact 'face on'. They remain in this position for the

duration of the information given by the device. The information has a profound influence on how the visitor views the artwork. The visitors follow the suggestions by the audio-comment and briefly look at features of the artwork highlighted by the PDA. However, a moment later they orient again to the screen. The structure of the audio-/video-commentary delivered by the device requires visitors to ongoingly maintain attentive to the device, if they do not want to miss interesting information. The content often involves information about details of the exhibits or the process of their production that are of particular interest to the visitors because they are not accessible elsewhere in the exhibition. Whilst the visitor stands at the exhibit, therefore, they primarily remain oriented to the device that shows text, images or short films rather than the original artwork. The PDA displaces and becomes a substitute to the authentic object (cf. Walter 1996).

### Interaction and Collaboration

The contemporary art museum is very popular with the public and is normally populated by large numbers of visitors. They normally come with companions and coordinate their conduct in the exhibition with others present in the same gallery. When given the opportunity to use a PDA often all the members of a group decide to have one.

A couple explores the exhibition, both using a PDA. When they stand at a painting the woman tries to draw her companion's attention to one particular exhibit feature. She turns to him to talk. However, the man does not attend to her. The woman then takes off her headphones which he notices and responds to by removing his. Both visitors display their readiness to talk and begin a brief discussion of the artwork.

A couple explores the exhibition both using a PDA. When the man turns to leave the painting his wife remains with the exhibit to complete the information delivery. As she turns around her companion has already reached the exit to the gallery. She catches up with him and they engage in a brief exchange. When they arrive in the next room they try to synchronize their PDAs

by touching the screen at the same time which does not work. The man then unplugs the headphones of his companion and looks for a second socket at his device. However, the PDA is not designed for a dual connection of headsets.

The PDA makes it difficult for visitors to engage in talk and discussion. The small screens and headphones do not allow others to retrieve information displayed on or overhear the audio-comment delivered by the device. The content is delivered in a single stream that does not encourage visitors to interrupt the delivery and engage in interaction and discussion. Talk arises either due to a technical problem or crash of the computer system or when visitors leave the exhibit and go to the next room. They talk with another about the exhibit and the information delivered by the devices when they are on the move and do not have access to either the artwork or the digital content. Visitors often display their dissatisfaction with the design of the device and try to engage in interaction with another. They seek ways to overcome the PDA's technical restrictions to display information to more than one visitor at a time. They look for ways to access each other's audio-content, try - but often fail - to share images and film displayed on the screen and drop the use of one PDA to discuss the content delivered by the one they keep.

Visitors examine the exhibition in the presence of many others who they do not know. Despite not being with those others they coordinate their conduct in the exhibition with them to organize how each can view the artwork.

A visitor stands at the sculpture in the first room. He looks at the screen of the PDA and listens to the information. His posture and tilted head display his orientation to the device. After a few moments, other visitors approach behind him. They briefly stop and glance first at him and then at the exhibit before they decide to leave this part of the gallery. The visitor does not display any response to the presence of the others in his domain.

A visitor stands at a painting oriented to her device as others huddle behind her to view the artwork. After a few moments she

turns around and tries to walk off as she almost bumps into those in her back who she had not noticed.

Visitors dwell at the exhibits as they listen to the information on the PDA. As long as they stand at the exhibit other visitors hesitate to approach it. Visitors with PDAs normally stand at the exhibit with their head tilted forward looking at the screen. The sensory seclusion of visitors using the PDA together with the size of the display often produce problems for the coordination of access to the exhibits. The visitor with the PDA often is not aware of events in their locale. They are desensitized from the immediate environment and do not show consideration for the arrival of others. They do not seem to 'sense' the presence of others and become an obstacle for them and for the 'natural' flow of people in the exhibition. They obstruct access to the original object for others who consequently often move on without having been able to examine the exhibit.

### **Creating audiences**

Aside from the deployment of mobile information devices in museums there is also growing interest in using fixed, digital displays in art and decorative art museums to provide information concerning particular exhibits. Such displays have important advantages over conventional labels;- content can easily be restructured and changed, text can be accompanied by more complex materials, including pictures and short films, and visitors can be provided with various opportunities to select different types of information by different media (Schulze 2001; Thomas et al. 1998; Wohlfromm 2002).

The British Galleries at the Victoria and Albert Museum in London have installed a small number of these 'information kiosks' in order to enhance information concerning particular exhibits. A case in point is a splendid 19<sup>th</sup> Century washstand by William Burgess. To one side of the piece is a monitor that shows a short film, lasting about two minutes, that illustrates the design and operation of the washstand. The film consists of a series of interconnected but continuous parts of information that focus on particular aspects of the piece. Each of these parts includes one or two subtitles summarising a particular feature of the piece, for example, 'the bowl is emptied into the container underneath'. The monitor is placed on a low stand to the

right of the Burgess washstand. The film is begun by touching the screen and continues without interruption until the end.



Figure 1: Visitor viewing the film at the touch-screen

There is significant variation in whether people use the interactive and if so, how. It is largely dependent on the presence and behavior of others, both those that they are with and others who just happen to be in the same space. For example, it is not unusual, if the gallery is relatively empty, for individuals to look at the piece, watch the video, and then re-examine aspects of the washstand in the light of the information shown in the video (Figure 1). When the gallery is more crowded it becomes increasingly difficult for visitors to both view the piece and then watch the film;- for example, it is not unusual for visitors to glance at the Burgess piece and, seeing people watching the video, simply move on rather than wait for their turn. The angle at which visitors approach the washstand also bears upon how they use the information display. For example, if they approach from right, where the monitor is positioned, then, if the monitor is accessible, visitors will watch the video before looking at the object. Indeed, it is not unusual for visitors to watch the video, occasionally glancing at the exhibit, and as the film comes to end, to momentarily glance at the piece before moving on (Figure 2). The quality of the film and complexity of the images provides the visitor with access to details of the washstand that are unparalleled by viewing the object in the gallery space.- It is not surprising therefore to find that the display become a substitute for looking at the object and does not necessarily encourage people to examine the piece in detail. In one sense, therefore, the video undoubtedly extends 'dwell time' at this area of the gallery. The fact that visitors spend time watching the film without necessarily examining the

object may not be important, but it once again points to the rather fragile relationship between interactives and the objects whose interpretation and exploration they are designed to enhance. It also stands in contrast to the ways in which people use conventional labels and gallery cards as resources for looking at the original object (cf. Callanan et al. 2002; McManus 1989).



Figure 2: Two visitors at the Washstand by William Burgess

The interactive display, the video, also serves to encourage particular forms of participation; participation that does necessarily facilitate interaction and discussion between people. It is not unusual for visitors when watching the film together to fall silent, to become an audience, for the duration of the short programme. Occasionally they will say something, perhaps look up, and even point to a feature of the washstand, but to a large extent social interaction is limited to watching the programme with someone else. Of course, in some cases, the programme serves to encourage discussion following its completion, but this depends upon how people have approached the exhibit, its accessibility, and of course their willingness to discuss the piece further. Visitors will make brief comments and occasionally glance at the exhibit itself, but to a large extent their co-participation is limited to a mutual alignment towards the film.

This may not be surprising. The narrative structure of the film and its uninterrupted flow to completion limits the opportunities for visitors simultaneously to look at the object or converse with each other. If visitors do look up and examine the piece for more than a second or so, then they may well miss the next part of the film, which demonstrates or illustrates some aspect of the exhibit. Similarly, if visitors exchange more than a brief comment, then their talk soon becomes unrelated to the material they are viewing on screen. Moreover, any comments that are made encourage the co-

participant to turn and look at some feature of the exhibit itself; yet, if they respond appropriately, they are likely to miss the next part of the film.

Visitors go to some lengths in an attempt to co-participate in simultaneously watching the video and looking at the exhibit. Once again we find examples of a division of labour emerging, where one visitor will watch the video and speak the subtitles as they appear, while his/her partner inspects the actual piece. Rather sadly, however, these forms of collaboration often lead to difficulties since the visitor viewing the piece will demand their partner's attention in examining some feature of the washstand, while she attempts to continue to watch the film. Unfortunately perhaps, the structure and pace of the film provides limited opportunities for simultaneous participation in examining the exhibit, watching the video and discussing the object in question. When visitors do attempt to use the film to create a more collaborative examination of the exhibit, for example by selectively speaking the subtitles to a partner, tensions arise between the interaction of the visitors and the structure and demands of the film. There is a delicate process of negotiation through which the visitors attempt to establish and maintain a common focus of involvement that interleaves the film with the exhibit, but within moments a fragmentation generally arises or the second person simply joins his/her partner and watches the video.

None of this is to suggest that the accompanying films are not interesting and informative. In the case of the Burgess exhibit the film dramatically illustrates aesthetic and functional aspects of the washstand that would be difficult, if not impossible, to describe in a label or even in accompanying pictures. However, the location, length and structure of the film have a significant impact on the ways in which visitors inspect and experience the original washstand and, more broadly, the ecology of participation and interaction that arises within the area of the exhibit itself. The film engenders particular forms of participation and can temporarily transform visitors into an audience, undermining their ability to explore and discuss the piece collaboratively. The relationship between viewing the film and inspecting the object is highly dependent on the presence and actions of others within the same space and even on the direction from which the visitor approaches this particular area of the displays. However, unlike a conventional label, which provides resources for comment and discussion and the collaborative inspection of the exhibit, the film does

not necessarily remain subservient to the object it is illustrating and, rather than engendering discussion, it can transform the visitor into a more passive participant while removing the necessity to examine the object.

## **Discussion**

The discussion of visitors' use of the PDA and the information kiosk show that new technology can provide individuals with interesting and valuable information about the arts and decorative arts. Both cases discussed in this paper refer to cutting-edge technologies as they are currently being deployed in art museums. They are very well designed and cause relatively few technical problems. Moreover, visitors use and seem to appreciate the novel interpretation devices. Yet, some skepticism towards the increasing enthusiasm for these kinds of computer-based interpretation device in museums is applicable and pertinent.

The case-studies point to the inadequacy of conventional methods and techniques to account for digital interpretation devices in museums. Such methods may be able to demonstrate a rise in visitor numbers to an exhibition after the deployment of new technology or an increase in the time visitors spend with exhibits but they do not assess the quality of visitors' experience of exhibits. Research in visitor studies has begun to address this gap but remains primarily concerned with the individual visitor and their behavior. Only fairly recently social aspects of the museum visit have been taken more seriously, however surprisingly without consideration of social scientific theories and concepts of social action and interaction.

Ethnographic and video-based research coupled with existing accounting methods may help enhance the effectiveness of museum accounting. Financial accounting and behavioral studies of the museum experience provide important findings concerning the success and effectiveness of museums. However, they ignore the museum's mission and agenda and are inadequate to reveal the quality of visitors' experience of exhibits. Ethnographic and video-based methods may provide an opportunity to address this shortcoming of conventional accounting techniques and visitor studies. They can reveal the ways in which visitors organize the action and interaction at exhibits by virtue of which they experience and make sense of exhibits.

The two case-studies discussed in this paper reveal that visitors who use PDAs and information kiosks spend relatively long at the exhibits but primarily orient to the device, rather than the original artwork. The PDA displaces the original object. It also hinders social interaction and talk amongst visitors because hardware and content are designed and structured for retrieval by an individual rather than a pair or a group of visitors.

‘Interactive’ information devices are designed to facilitate particular forms of conduct and experience and rely on visitors using the exhibit or artifact in particular ways. They may even necessitate the visitor interrelating objects and making connections between exhibits that are not necessarily located together. Unfortunately, however, visitors do not necessarily respond in the ways we imagine or hope, and circumstances may arise that make it difficult if not impossible for them to undertake the pattern of action required by the ‘interactive’. Even if we reflect on one of the more seemingly straightforward assumptions entailed in many ‘interactives’ and exhibitions – that visitors will normally follow particular navigation paths and thereby be in a position to undertake the relevant actions in the appropriate sequential order – we can see how easily such an assumption may be undermined simply by virtue of the number of visitors or different pace or direction in which they pass through the galleries. These and many more considerations besides are important factors in designing exhibitions and need to be placed high on the agenda when we are developing ‘interactives’ (Heath et al. in press-b).

Rather than abandoning the idea of developing and deploying novel interpretation technologies in art museums our research has led us to develop a number of *design sensitivities* concerning interface technology and content of novel interpretation devices.

1. Portable technology that is not tied to an individual user, but designed to facilitate sharing between multiple visitors may be preferential.
2. Display technology may be used that allows for multi-party participation and facilitate overhearing and co-participation.
3. Screens that deliver information to be viewed or read should allow multiple people to view it from different angles.

4. The structure of the content may encourage visitors to view the exhibit at certain points and thus facilitate the interweaving of information from the device with the exhibit itself.
5. The content may be designed to stimulate comments and discussion about the original exhibit.

In some exhibitions large, tangible and portable interpretation devices prove relatively successful in informing visitors about exhibits and encouraging interaction and discussion. For example, many conventional art exhibitions like the Raphael cartoons at the Victoria and Albert Museum, galleries of the Louvre in Paris and the Musée de Rouen, provide visitors with large paper cards. These interpretation devices are mobile and non-interactive. They contain text and images concerned with the exhibits in the galleries. They are designed to allow companions to share one card and use the information to collaboratively examine the exhibits. Observations in the Musée de Rouen show how visitors use these cards to comment on and discuss exhibit features whilst they examine the original artifact (Heath & vom Lehn in press-a). These tangible and material devices provide visitors with resources to interweave textual and visual information with aspects of the exhibits. It seems that there may be some trade-off in utilizing the benefits of such kinds of low-tech interpretation device which have proved relatively effective in the past, and augment them with computer technology. Recent developments in technology design may provide us with tools and technologies to augment paper and other kinds of familiar, tangible artifacts that can support social interaction and discussion at the exhibit-face.

These observations and findings derive from our ethnographic and video-based studies of visitors examining and making sense of exhibitions. They point to the inadequacy of conventional methods and techniques employed to assess visitors' museum experience and to account for investments in novel interpretation devices for museum exhibitions. They suggest that methods and techniques need to be developed that aid our understanding of how the experience of exhibits as it emerges at the exhibit-face. Current accounting practice in museums often focuses on the individual visitor and their behavioral response to exhibits and ignores the processes of action and interaction by virtue of which visitors experience and make sense of artwork.

Ethnography and video-based field studies coupled with a relevant methodological framework provide an opportunity to address and unpack the conduct and interaction by virtue of which visitors examine and experience exhibits. Coupled with more conventional practices to measure accountability of museums like those used by experts in Visitor Studies, ethnography and video-based field studies cannot only contribute to our understanding of the museum experience, but also to the development, evaluation and deployment of exhibits and novel interpretation devices, especially those perhaps which are designed to create new forms of co-participation and interaction. Technology is transforming the museum environment and it has become increasingly important to understand how these developments may enhance or impoverish interaction in and the experience of museums.

## **Acknowledgements**

We would like to thank the participating museums, in particular the Victoria and Albert Museum in London and the contemporary art museum, the team of the company who designed the PDA and the content of the multimedia tour that so generously supported our research. We particularly thank the visitors who participated in this investigation. We also would like to thank Carol Martins, Dr Andrea Sudbury and members of the WIT research group at King's College, in particular Jon Hindmarsh and Paul Luff. The project has been funded as part of the ESRC/EPSRC PACCIT Programme Project No. L328253030. It contributes to the NSF-funded Centre for Informal Learning in Schools (CILS).

## **Bibliography**

- Aoki, P. M., R. E. Grinter, A. Hurst, M. H. Szymanski, J. D. Thornton and A. Woodruff (2002). *Sotto Voce: Exploring the Interplay of Conversation and Mobile Audio Spaces*. Chi 2002, Minneapolis, ACM-Press.
- Callanan, M. A., J. L. Jipson and M. Stampf Soennichsen (2002). Maps, Globes, and Videos: Parent-Child Conversations about Representational Objects. *Perspectives on Object-Centered Learning in Museums*. S. Paris. Mahwah, NJ, Lawrence Earlbaum Associates: 261-283.
- Carnegie, G. D. and P. W. Wolnizer (1996). "Enabling accountability in museums." *Accounting Auditing & Accountability Journal* 9(5): 84-99.
- Carnegie, G. D. and B. P. West (2003). "How Well Does Accrual Accounting Fit the Public Sector?" *Australian Journal of Public Administration* 62(2): 83-86.
- Debenedetti, S. (2003). "Investigating the Role of Companions in the Art Museum Experience." *International Journal of Arts Management* 5(3): 52-63.
- Exploratorium (2001). *Electronic Guidebook Forum*. San Francisco, Exploratorium.

- Falk, J. and L. Dierking (2000). *Learning from Museums. Visitor Experiences and the Making of Meaning*. Walnut Creek, Lanham, New York and Oxford, Alta Mira Press.
- Fleck, M., M. Frid, T. Kindberg, E. O'Brian-Strain, R. Rajani and M. Spasojevic (2002). From Informing to Remembering: Deploying a Ubiquitous System in an Interactive Science Museum. Palo Alto.
- Goulding, C. (2000). "The museum environment and the visitor experience." *European Journal of Marketing* 34(3/4): 261-278.
- Heath, C. and D. vom Lehn (in press-a). "Configuring Reception: Looking at Exhibits in Museums and Galleries." *Theory, Culture & Society*.
- Heath, C., D. vom Lehn and J. Osborne (in press-b). "Interaction and Interactives." *Public Understanding of Science*.
- Hein, G. (1998). *Learning in the Museum*. Cambridge/MA.
- Hensel, K. (1987). Families in a museum: interactions and conversations at displays. *Teachers College*. New York, Columbia University.
- Keene, S. (1998). *Digital Collections. Museums and the Information Age*. Oxford, Butterworth & Heinemann.
- Landry, C. (1994). Measuring the Viability and Vitality of City Centres. *Urban and Regional Quality of Life Indicators*. C. Mercer. Brisbane, Institute of Cultural Policy Studies, Faculty of Humanities, Griffith University.
- Lave, J. and E. Wenger (1991). *Situated Learning. Legitimate peripheral participation*. Cambridge, Cambridge University Press.
- Leichter, H. J., K. Hensel and E. Larsen (1989). "Families and museums: Issues and perspectives." *Marriage and Family Review*. 13(4): 15-50.
- Leinhardt, G., K. Crowley and K. Knutson, Eds. (2002). *Learning Conversations in Museums*, Lawrence Erlbaum Assoc.
- Matarasso, F. (1997). *Use or Ornament? The Social Impact of Participation in the Arts*. Near Stroud, Comedia.
- McManus, P. (1989). "Oh yes, they do: How museum visitors read labels and interact with exhibit text." *Curator* 32(3): 174-180.
- McManus, P. (1994). Families in Museums. *Towards the Museum of the Future: New European Perspectives*. R. Miles and L. Zavala. London, Routledge: 81-97.
- Rentschler, R. (1998). "Museum and Performing Arts Marketing: A Climate of Change." *Journal of Arts Management, Law and Society* 28(1): 83-96.
- Schulze, C. (2001). *Multimedia in Museen. Standpunkte und Aspekte interaktiver digitaler Systeme im Ausstellungsbereich*, Deutscher Universitäts-Verlag.
- Screven, C. (1991). *Computers in Exhibit Settings*. Visitor Studies: Theory, Research, and Practice. 1990, Washington, DC, The Center for Social Design.
- Serrell, B. (1998). *Paying Attention: Visitors and Museum Exhibitions*. Washington D.C., American Association of Museums.
- Serrell, B. and B. Raphling (1992). "Computers on the Exhibit Floor." *Curator* 35(3): 181-189.
- Shettel, H. (2001). "Do we know how to define exhibit effectiveness?" *Curator* 44(4): 327-334.
- Spasojevic, M. and T. Kindberg (2001). A Study of an Augmented Museum Experience, Hewlett Packard: 6.
- Thomas, S. and A. Mintz, Eds. (1998). *The Virtual and the Real: Media in the Museum*. Washington, DC, American Association of Museums.

- Thompson, G. D. (1999). "What's wrong with New Zealand's Service Performance Reporting Model: The Case of Public Museums." *Public Management* 1(4): 511-529.
- Thompson, G. D. (2001). "The Impact of New Zealand's Public Sector Accounting Reforms on Performance Control in Museums." *Financial Accountability and Management* 17(1): 5-21.
- vom Lehn, D., C. Heath and J. Hindmarsh (2001). "Exhibiting Interaction: Conduct and Collaboration in Museums and Galleries." *Symbolic Interaction* 24(2): 189-216.
- Walter, T. (1996). "From museum to morgue? Electronic guides in Roman Bath." *Tourism Management* 17(4): 241-245.
- Wenger, E. (1999). *Communities of Practice: Learning, Meaning, and Identity.*, Cambridge University Press.
- Wertsch, J. (1991). *Voices of the Mind.* London, Harvester Wheatsheaf.
- Wohlfromm, A. (2002). *Museum als Medium. Neue Medien in Museen.* Köln, Herbert von Halem Verlag.
- Woodruff, A., P. M. Aoki, A. Hurst and M. H. Szymanski (2001). *Electronic Guidebooks and Visitor Attention.* Proc. 6th Int'l Cultural Heritage Informatics Meeting,, Milan, Italy.
- Wu, C.-t. (2003). *Privatising Culture. Corporate Art Intervention since the 1980s.* London, Verso.