Far away is close at hand: an ethnographic investigation of social conduct in mixed reality museum visits

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I would like to dedicate this thesis to my father
who was very excited and utterly supportive
with my newly developed involvement
in computing science research. I did it, dad!

Αφιερώνω αυτή τη διατριβή στον πατέρα μου,
που ήταν πάντοτε ενθουσιώδης με την ενασχόλησή μου
με τους ηλεκτρονικούς υπολογιστές.
Μπαμπά μου, τα κατάφερα!

Abstract

This thesis investigates how museum companions organise their conduct regarding their engagement with the exhibition and their social interaction with each other in the course of a visit. The main objectives of the thesis are the empirical investigation of social conduct in casual group museum visits and the exploration and understanding of social conduct in real–time distributed museum visits through mobile mixed reality technology. A third area of interest is the application of qualitative methodology, based on ethnomethodology and ethnographic methods, for the fulfillment of the above objectives.

In particular this thesis presents and discusses fieldwork of collocated casual group visits alongside video recordings and interviews collected in distributed museum visits during trial sessions in the *Mack Room mixed reality museum environment*. Drawing on vignettes of activity among collocated and distributed participants, the thesis develops discussion around three themes: the collaborative exploration of museum artefacts, aspects of the collaborative management of shared museum visits and the constitution of the visiting 'order' in and through social conduct. Among others, issues of collaborative alignment, awareness, indication of engagement and disengagement and conflicting accountabilities are discussed.

The contribution of this thesis in current research in museum studies, CSCW and social science is explored. Findings reported in this thesis extend current visitor studies research to include the study of social conduct in the management of collocated visits and the constitution of visiting order. They also suggest that studies of sociality among distributed visitors may open opportunities for museums to support mutually complementing local and distributed experiences. With regard to understanding asymmetries in mobile mixed reality environments, the thesis points out that asymmetries could be better understood with reference to the activity in context rather the technological features themselves. This thesis also makes a contribution to social studies research with regard to exploring the changing character of talk in distributed collaborative settings. Future research with respect to mixed reality applications for museum visits is also outlined.

Declaration of originality

I certify that I am responsible for the work submitted in this thesis, that the original work is my own except as specified in acknowledgments or in footnotes, and that neither the thesis nor the original work contained therein has been submitted to this or any other institution for a higher degree.

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Associated publications

Aspects of the research presented in this thesis have been discussed in the following publications (in relative chronological order):

Galani, A. and M. Chalmers (in press) Blurring boundaries for museum visitors, in *Museum Informatics*, Marty, P. and K. Jones (eds.). Francis & Taylor.

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Galani, A. and M. Chalmers (2004) Production of pace as a collaborative activity, in *Extended Abstracts of CHI 2004*, Vienna, Austria. ACM, pp. 1417-1420.

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Galani, A., Chalmers, M., Brown, B., MacColl, I., Randell, C. and A. Steed (2003) Developing a mixed reality co-visiting experience for local and remote museum companions, in *Proceedings of HCII 2003*, Crete, Greece. Lawrence Erlbaum Associates, pp. 1143-1147.

Galani, A. (2003) Mixed reality museum visits: Using new technologies to support co–visiting for local and remote visitors, *Museological Review Extra*, special issue 10, pp. 1-15.

Brown, B., MacColl, I., Chalmers, M., Galani, A., Randell, C., and A. Steed (2003) Lessons from The Lighthouse: collaboration in a shared mixed reality system, in *Proceedings of CHI 2003*, Fort Lauderdale, Florida. ACM Press, pp. 577-584.

MacColl, I., Millard, D., Randell, C., Steed, A. et al. (2002) Shared visiting in EQUATOR city, in *Proceedings of CVE 2002*. ACM Press, pp. 88-94.

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1 | Introduction

Social conduct and collaboration plays an important role in people's everyday activities and their process of making sense of their environment. It is also a fundamental aspect of use and appropriation of technology in many and diverse environments. This thesis investigates social conduct and collaboration in the context of a museum visit. It focuses on how social conduct is produced and recognised during the time of the visit, in particular among members of non–educational groups of visitors. It also examines how social conduct may shape the overall visiting experience. The thesis looks at conduct and collaboration in two different situations: among collocated visitors in traditional galleries and among non–collocated visitors who use a mixed reality museum environment; it focuses on the latter. This thesis, therefore, draws from and contributes to research in the combined field of social sciences and Computer Supported Cooperative Work (CSCW). It also aims to broaden the field of visitor studies and museums and new media, and expand the understanding of use of mixed reality environments for leisure activities. The rest of the introduction offers an overview of the motivation and objectives of this thesis, outlines the setting of the research and introduces the structure of the manuscript.

1.1 Motivation and objectives

Museum visiting is a social experience. It is broadly accepted in the museum studies community that social interaction plays a significant role in the museum experience, in both its aesthetic and learning outcomes. Falk and Dierking (1992), in their book *The Museum Experience*, explicitly identified social context as a paramount aspect of what they call "interactive museum experience". The importance of sociality in museum visiting has been claimed in several practical and theoretical investigations. Despite this recognition, only limited research, both in museology and social sciences, has actually looked at social interaction *in situ*, inside the galleries, at the face of displays and around exhibits and exhibition environments. Furthermore, technological innovation, in both commercial and experimental levels has mainly focused on recording, organising and delivering information to the end–user, the visitor. Whereas technology, and especially mobile devices, is often criticised for inhibiting social interaction in the visit.

Additionally, the majority of current technological intervention in museums appears to target the visitors in the gallery, whereas remote access is often limited to serve e–learning and scholarship.

In contrast, recent research in technology has explored and supported sociality among distributed users in many different situations, both work and play related. Technologies such as media spaces, collaborative virtual environments (CVEs), mixed realities and ubiquitous systems, as well as combinations of them, have already been studied for their effect on social conduct and collaboration. Those studies have a bearing on this present investigation.

It is within the objectives of this research to focus on social conduct among casual visitors and identify ways sociality shapes the visiting activity and is shaped by it. The thesis therefore treats social conduct as "*context–shaped* and *context–renewing*" (Heritage 1984: 242), i.e. an intrinsic aspect of the co–visiting activity that is organised, produced and recognised moment–by–moment in and through social interaction among the participants. As a result, the discussion focuses on real time social interaction. This notion of sociality is examined in both collocated museum visits and in distributed group visits, to further our understanding of the activity and to establish and explore research issues with regard to synchronous distributed social museum visiting.

Overall, this thesis has two main research goals: the empirical investigation of social conduct in casual group museum visits, and the exploration and understanding of social conduct in real–time distributed museum visits through mobile mixed reality technology. A third area of investigation is the application of a qualitative methodology based on ethnomethodology and ethnographic methods for the fulfillment of the above objectives. Although this research acknowledges the importance of social conduct in museum learning, this aspect is not a focus of this thesis.

1.2 Research approach

This research is based on the belief that qualitative exploration in the ethnographic

fashion may successfully reveal elements of the everyday production of social conduct and its role in the achievement of activities, especially in cases where the notion of task is loose and elusive, such as in museum visiting and related leisure activities. Fieldwork in the ethnographic fashion (Hammersley and Atkinson 2000) was undertaken in two situations: in group visits without mixed reality technology, and during trial sessions with the technology. In the first case, unobtrusive observations of non–educational groups of visitors were conducted in two cultural institutions in Glasgow, the House for an Art Lover and the Mackintosh Interpretation Centre in the Lighthouse. The purpose of the investigation was to provide an overall understanding of group visitor behaviour, non–verbal conduct as well as verbal communications when available. The results of these studies were complemented by a corpus of research on conduct and participation in museums and galleries (Heath, Luff et al. 2002; vom Lehn 2002; vom Lehn, Heath et al. 2001), that was published during the time of the investigation. In the second case, video recordings and interview transcripts were collected during trial visiting sessions in a mixed reality museum environment in the Mackintosh Interpretation Centre (Mack Room). The *Mack Room mixed reality environment* was designed to facilitate real–time social visiting among local and remote groups of friends.

The analytical treatment of the data was inspired and informed by issues discussed in ethnomethodological research (Garfinkel 1967), conversation analysis (Sacks 1998) and interaction analysis (Jordan and Henderson 1995). The whole process was complemented by the reviewing of museological, sociological and technological literature, more specifically research done in the areas of visitor studies, museum informatics, workplace studies, mixed reality technologies, media spaces and CSCW. Selected literature on design of new technologies was also consulted. The practical details concerning the fieldwork as well as the methodology and methods used in the collection and analysis of the data will be discussed in Chapter 4.

1.3 Outcomes of the research

The detailed study and presentation of social conduct among collocated and

distributed museum companions is one of the main contributions of this thesis. The thesis confirms findings from previous studies with regard to the essential role of social conduct in the exploration of museum displays. Furthermore, it establishes the fact that social conduct among co–visitors shapes the management of the overall visit and influences the visiting order of the setting. Additionally, the thesis pioneers the study of mixed reality museum environments from a social interaction perspective, since similar research appears not to have been pursued so far elsewhere.

Based in these findings, the thesis argues that deeper understanding of the social character of the museum visit, through ethnographic techniques, may offer useful insights and reference points to studying and understanding technological applications that attempt to support social synchronous visiting activities among local and remote participants. This research indicates that heterogeneous media, such as mobile devices, web–based media and virtual environments may successfully support sociality in museum co–visiting. It further discusses the ways participants handled (or indeed failed to handle) the inherent asymmetries of mobile mixed reality applications. Furthermore, the study of technology that supports social interaction across media may also offer insights on how remote visitors can additionally benefit from social aspects of the visit currently unsupported.

1.4 Research setting

The research that supports this thesis was conducted within the EPSRC–funded Equator IRC's *City* project. The Equator Interdisciplinary Research Collaboration (IRC)[1] brings together researchers that are interested in art, psychology, sociology, design and computing science. The *City* project was one of the initial 'experience projects'[2] deployed by the IRC with Glasgow University as a leading

[1] Information about the goals and activities of the IRC can be found on http://www.equator.ac.uk.
[2] The experience projects were application–oriented activities that explored methods, models and technologies to further understand emerging technological innovation and infrastructure as well as interaction. Experience projects in the Equator IRC also included "The hunting of the Snark", an adventure game designed to promote novel forms of playing and learning for young children using a diversity of ambient and pervasive technologies, a series of 'City Wide' performances and pervasive games such as "Can you See Me Now?" and "Uncle Roy All Around You", the

partner and three other main partners—Bristol University, Nottingham University and University College London—contributing various aspects of their expertise. The partners in the project also informed various design decisions, such as the type of the technologies to be implemented and explored. For example, the challenge of designing, implementing and evaluating positioning technology, which was one of main research topics of the fellow researchers from the University of Bristol, became an intrinsic part of the *City* project.

The overall aim of the *City* project is to explore social interaction in cultural institutions and the city, and how sociality may be supported by technological development. The first phase of this exploration was focused on museums and cultural institutions, while the subsequent stage looked at similar research questions in the field of tourism (Brown, Chalmers et al. 2005). More recently the *City* project has been looking into mobile pervasive games as a vehicle to explore the design principle of 'seamfulness' (Chalmers, Bell et al. 2005; Chalmers and Galani 2004). The project involves the design, implementation and study of novel combinations of ubiquitous technologies, hypermedia and virtual environments to support rich social experiences. It also investigates theory that might inform this research.

The project team that was involved in the first phase of the project, which looked at technological innovation in museums and other cultural settings, was highly multidisciplinary. The members of the team brought skills in designing, developing and theorising interactive systems, virtual environments, mobile systems, and middleware technology; they also had substantial experience in sociological research, especially ethnography and ethnomethodology, with myself being the 'museum studies' expert. The consensus among the members of the team was facilitated by the circulation of 'work in progress' scenarios that were used as a resource for inspiration and common reference rather than concrete design ideas. (Examples of these scenarios can be seen in Appendix 1).

A set of initial observational studies in two cultural institutions in Glasgow and

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"Domestic probes" and the "Weight Furniture" projects that looked at the process of designing and developing novel technologies for domestics environments, and so forth.

qualitative studies of a mixed reality system for collaborative museum visiting were fundamental parts of the whole research process of the project. The analysis and discussion of these studies is the core of this thesis. As an integrated part of a bigger project, this research was designed to function on two levels: to inform the design of technology and to enhance the understanding of social conduct during museum co–visiting, with and without the support of technology. Additionally, it was bound to meet deadlines imposed by the overall design progress of the project and its results, to become accessible to a range of researchers in a multifaceted design team. This role often drove the selection of specific methods and approaches during data collection and analysis, in the first instance. Further engagement with the data was undertaken for the development of external publications and the writing of this thesis. The process of data analysis also happened in several stages and the stages were often defined by different needs such as requirements capture, understanding, prototyping and evaluation, and public dissemination of results.

Furthermore, this research has examined a specific combination of technologies, the *Mack Room mixed reality system*, which will be described in some detail in Chapter 3. As far as I understand this combination is unique in the fact that it brought together communication media, ubiquitous technologies—such as location tracking—hypermedia technology and virtual environments to support a single real–time visiting activity among local and remote participants. This approach and its social characteristics had not been attempted and studied before in museum technologies, therefore direct comparison with other systems was not pursued. However, other museum application and mixed reality systems, often unrelated to museum settings, have been reviewed through publications.

1.5 Structure of the thesis

This thesis is developed in three parts with distinct functions and styles of presenting materials and arguments. The first part, that also includes this introduction, contains the three following chapters:

Chapter Two presents an overview of studies of social interaction in museums

and the technological applications that aim at supporting sociality in museums—and elsewhere. It also clarifies the conceptual context of this research with reference to museological, sociological and technological thinking. **Chapter Three** offers an overview of the settings where the studies took place. It also introduces the technology used in the mixed reality environment. Additionally, it explains the terminology used in this thesis to refer to the settings of the empirical investigation. **Chapter Four** presents the methods that were used in the collection of the data and the analytical orientation of the research based on ethnomethodology. It also discusses the tension of combining different kinds of data under the same analytical purpose.

For the purpose of this research, multifaceted fieldwork was undertaken. The discussion of the data from the fieldwork occupies the second part of the thesis; it is organised in three chapters. All chapters present incidents from both collocated and distributed visits.

Chapter Five looks at how people share their exploration of displays with their friends during the visit. Core to the chapter is the social interaction around displays. The role of awareness in companions' conduct is also discussed. **Chapter Six** looks at the management of the visit and how it is achieved in and through social conduct. The core of this chapter is the discussion about the initiation and the pace of the visiting activity. **Chapter Seven** takes a step back and looks at how the orderliness of the co–visiting activity is constituted through social conduct. This chapter also explores possible effects of mixed reality technology in the 'ecology', norms and order of the museum setting.

The last part of the thesis includes two chapters:

Chapter Eight discusses the findings of the research and relates them to implications for museum practice, technological and sociological research. The contributions of this thesis are also outlined. **Chapter Nine** concludes the thesis, reflecting on the methodological choices and summarising its main contributions. Directions for future work are also discussed.

1.6 Conclusion

This research spans several disciplines, such as museum studies, social science and computing science. Specific aspects of these domains such as visitor studies, ethnography, ethnomethodology, and CSCW have played an important role with regard to the research approach, the understanding of the topic and, consequently, the development of the arguments in this thesis. The thesis often favours the museological standpoint. It treats the participants in the studies primarily as visitors, or museum users, and secondarily as technology users. The next chapter untangles the interdisciplinary background of this work and defines the area of research which this thesis contributes to.

2 | Related work and research focus

This thesis looks at issues of social conduct in collocated and distributed museum co–visiting activities. It discusses the current knowledge of social conduct among collocated adult visitors and explores sociality in synchronous distributed visits that are supported by mixed reality technology. The overall development of this investigation draws, among others, on museological and computing science literature that examines sociality in museum visits and technology mediated social conduct respectively. In the process, it investigates how social conduct influences the use of technology and is shaped by it. This chapter offers a selective overview of the above mentioned themes and indicates how this present research fits in and enriches existing work in both disciplines, visitor studies and computing science.

2.1 The sociality of the museum visit

Museum visiting has always been considered a socially meaningful activity. From the first museum visits in the 19th century, when admission to museums was granted only to people with the appropriate references, to more recent policies that advocate 'museums for all' (DCMS 2000, 2001), museums have been concerned with their social role and predisposition[3]. The discussion about the social role of the museum has recently given ground to further discourse regarding the public character and function of the modern museum, e.g. whether it should resemble a temple or a forum (Cameron 1971), a piazza or a stadium (Bradburne 2003) and so forth.

Alongside the theoretical investigations of the topic, in the last few decades, visitor studies have looked at the more practical aspects of visiting and grounded the claim that museum visiting is not only a socially significant activity, but also a socialising activity, hence an opportunity to interact with other people. This section casts light in the ways sociality is discussed in visitor studies. It looks at statistics and visitors' motivations; it discusses the prevailing concepts of visiting experience and offers insight into the ways social conduct has been studied in

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[3] It is worth pointing out here that the social role of the museum was, and in the majority of cases still is, firmly associated with the concept of the museum as an appropriator of material culture, hence the function of the museum that is concerned with the collection, conservation, research, communication and exhibition of material evidence of people and their environment, for purposes of study, education and enjoyment (ICOM, http://icom.museum/definition.html).

museums with reference to museum learning and in terms of organisation of interaction among companions.

2.1.1 Statistical evidence

The social character of museum visiting has been primarily indicated in demographic surveys. Statistical evidence shows that singletons are the smallest portion of the museum visiting audience. Indicatively, Draper (1984) in his study of the Exploratorium in San Francisco, from 1977 to 1979, found that 75%-95% of all visitors visit with others. Studies at the Smithsonian between 1994 and 1996 also indicated that only 14% of their casual visitors had visited by themselves, as quoted in Weil (2002). According to Smith et al. (1996), singletons comprised 26% of casual visitors in the Metropolitan Museum of Art in New York which, despite the fact that it is the highest percentage of singletons reported in surveys, still remains the lowest portion of visitors. On European ground, Petrelli et al. (1998) in their study of three Italian natural history museums found that an average of only 5% of visitors visit alone. Furthermore, in 2001 a study of visitors' profiles in British museums, conducted by MORI on behalf of Re:source (MORI 2001), reported that only an average of 17% of all visitors visit alone.

It is evident that museum visiting, for a variety of potential reasons, is considered as a suitable, and as one might argue also valuable, social activity. The rest of this section presents some of these reasons and explores how social aspects of the visiting activity have been studied in museums.

2.1.2 Social motivation behind museum visiting

In the last decades, the improvement of visitor numbers and the audience diversity have been pressing concerns for museums and galleries[4]. These concerns reflect two changes in the museum field: the new orientation of the museum from exclusively object–centred to audience–centred institution (Davies 1994), and the increasing need for museums to become financially self–sustaining (Schubert

[4] These concerns appear to be of high priority in recent years too. The recent initiative by the British Council for Museums, Libraries and Archives (former Re:source) regarding *Renaissance in the Regions* (Re:source 2000) explicitly states that "an increase in the numbers of visits and visitors to the regional museums – both in general and specifically from areas of the highest social deprivation – must be a priority outcome".

2000). Within that framework, a series of studies adopted a visitor–centred approach and concentrated on identifying why people do (or do not) visit museums. These studies treated museum visiting primarily as a leisure activity, as opposed to an educational activity, and sought to examine visitors' intentions, motives, and preferences regarding the visit. In pioneering research about visitors and non–visitors in the metropolitan area of Toledo, Hood (1983) identified that "being with people" was highly valued among occasional visitors and non–visitors, and the limited socialising opportunities a reason for people not to visit museums. Similarly more recent bibliography suggests that "they [people] often come [to museums] first and foremost for social reasons" (Perry, Roberts et al. 1996: 26) and that in visitors' agendas, museum visiting is considered among others as a social event (Moussouri 1997), e.g. a "day out" with the whole family, friends and relatives.

Social reasons for museum visiting are based on one's desire to "do something special with a visiting friend or relative" (Falk 1998: 41), spend "quality family time" (Perry, Roberts et al. 1996: 26) as well as "pleasant companionship" and "making connection" (Combs 1999: 190; Silverman 1995) and to see one's "children learning new things" (Doering 1999: 10). Weil (2002) in his account of sociality in museums termed all the above reasons as "valuable social interactions" and he suggested that relaxed socialisation is supported by museums uniquely, among other cultural leisure activities, because of museums' relative informality.

The majority of visitor profiling studies used techniques borrowed from marketing, such as questionnaires, personal interviews and focus groups to capture people's motives and expectations of museums visits. Most of them produced quantitative results regarding museum visiting trends. Their main contribution, however, in museum practice is that they have triggered the realisation that social motivation may play a significant role in how people experience museum visits and therefore should be taken into consideration in the design and evaluation of museum experiences. They also made clear that museum–going is a leisure activity and therefore museums should seek to cater for leisure agendas along with the more traditional scholastic and educational

purposes, which, however, firmly remain as core values to museum experience.

2.1.3 Museum experience and sociality

The findings of user profiling, with regard to the social reasons behind museum visiting, initiated and complemented an extensive body of visitor studies that moved beyond the tradition of exhibit evaluation (e.g. (Bitgood 1994; Melton 1935)) to a more holistic approach to visiting behaviour and the museum experience. The starting point of these studies remained one's personal engagement with the museum objects and the exhibition message, but it was further examined within the wider context of the museum experience that also involved the social aspects of the visit. The diversity of these studies depicts the museum's effort to describe the dynamic and multifaceted character of the museum experience in order to design ways to cater for and evaluate it.

There has not been a unified definition of the museum experience in museum studies. Neither has there been a unified way of using the term 'experience'. Examining experience from the visitors' expectations point of view, Doering (1999) identified social experience as one of possible four experiences that are sought after by people when visiting museums—the others being object, cognitive and introspective experiences. Doering subsequently clarified that both museums and visitors can favour any of the experiences at any given moment. Specific types of museums, however, tend to support specific types of experience. For example, art galleries tend to support the object experience. Furthermore, Weil (2002), explored the public service role of the museum and argued that museums may provide their communities with entertainment, education, experience and socialising. However, in his discussion of the different roles, they all appeared to become blurred in practice.

The most dominant approach, so far, to understanding the museum experience from the visitor's perspective is the one articulated by Falk and Dierking in their book *The Museum Experience* (Falk and Dierking 1992). After extensive qualitative and quantitative studies of visitors' behaviour in American museums and the Natural History Museum in London, they introduced the *Interactive Experience Model* to analyse their findings. This model defined the museum

experience as the outcome of the interrelation of three contexts: the personal context, the social context and the physical context—to an extent, this also echoed Draper's (1984: 204) description of the museum visit as "a triangular relationship between ego, the other, and the object".

The personal context includes the knowledge, background, mood, state of mind of the visitor; the social context refers to people in the gallery, friends or strangers to the visitor; the physical context involves the material layout of the exhibition/museum. According to Falk and Dierking, a combination of those three contexts at any given moment in the visit creates the visitor's experience and supports learning. From those three contexts, the physical context is already put in place by the museum team but the other two are continuously and dynamically reconfigured by the visitor and the rest of the people in the museum. Falk and Dierking's approach to the relationship of context and museum experience argues that, at any given instance, a visitor's experience is situated and therefore unique—the same argument is implied in studies that look at museum visits as meaning making experiences, e.g. (Silverman 1995). Furthermore, changes in any of the three contexts may effectively influence the character of the overall experience. The situated and flexible character of the visiting activity is in the core of this thesis, as seen, however, from an empirical rather than conceptual point of view.

2.1.4 Social interaction and museum learning

Beyond the more general discussion about sociality in museums, the practical investigation of social conduct in group visits has been primarily examined with regard to learning. Supporting learning has been a dominant agenda in museum practice the last few decades. As a result studies of social interaction in museums have been almost explicitly approached from a cognitive stance and they have particularly focused on family groups (Baillie 1996; Dierking, Luke et al. 2001). They have looked at the social dynamics between sons and daughters (Blud 1990; Diamond 1986), the differences between children–peer groups and children–adult groups (Crowley and Callanan 1998), the potential impact of conversation on learning in families (Hensel 1987) and so forth, with some exceptions of adult learning (Draper 1984), just to mention a few. Recently, Packer et al. (2004), on

the basis of comparative research, reported non–significant differences in the learning outcomes of solitary and social visits and overtly questioned the impact of social interaction in museum learning. However, it would be useful to briefly examine the theoretical motivation of these studies and their contribution towards the understanding of social conduct in co–visiting activities.

A range of approaches grounded in cognitive science were used to study sociality in relation to museum learning. Linda Blud (1990) used Doise's socio–cognitive conflict hypothesis to inform her study of social interaction among family members in front of different types of displays in the Science Museum in London. Doise's concept argues that children learn by resolving cognitive conflicts and that this procedure is also facilitated by comparing their own view with the view of other people. Based on this hypothesis, Blud measured the conversational behaviours of families in front of exhibits and concluded that interactive displays trigger the "kind of discussions which could lead to socio-cognitive conflict processes, primarily debate and argument".

Socio–cultural theory and particularly the notion of 'scaffolding' in the work of the Russian social psychologist Lev Vygotsky (1978) has been particularly influential in the study of learning in museums. Based on Vygotsky's concept, the social context of an activity offers the appropriate scaffolding for children to learn and improve their competencies, since learning with others is more efficient than individual learning. This notion inspired experimental visitor studies that reported that visitor students in groups solved problems faster and more efficiently than individual students (Uzzell 1993). It also supported empirical studies of use of novel technology in museums (Stanton, O'Malley et al. 2003).

Vygotsky's ideas also informed the appropriation of the constructivist approach for museum learning by Hein (1998) and Falk and Dierking's development of the contextual model of learning. The contextual model of learning is a reiteration of their interactive experience model that was discussed in the previous section, which suggests that all learning in museums is necessarily socio–culturally mediated, i.e. happens within a socio–cultural context. Both bodies of research, pointed out that the museum should "organise[s] programmes to deliberately

capitalise on learning as social activity" (Hein 1998: 174), through the design of experiences that can be socially and physically shared by more than one visitor.

More recently, Leinhardt and her colleagues in the Museum Learning Collaborative Project (MLC) used as a starting point to their investigations Vygotsky's and Wertsch's notion of mediation that argues that humans construct meaning in social contexts as they interact with mediators such as talk, signs, symbols and activity structures. Their approach treated museum learning as a conversational elaboration (Leinhardt and Crowley 1998) and studied in detail conversations of groups of experts (Abu-Shumays and Leinhardt 2000) and casual visitors (Leinhardt, Knutson et al. 2003) in order to define a model of conversational engagement that indicates different stages of learning. Their work did not produce any design suggestions for museums but it formed a tool for exhibition evaluation based on an aspect of social interaction, namely visitors' conversations.

Beyond the use of conversation, which appears the dominant indicator of sociality in museums, Bandura's concept of 'social modeling' based on non-verbal cues has also been considered in visitors studies. Koran et al. (1988) used Bandura's and Walter's (1963) ideas of socially mediated learning through non–verbal cues to study visitors' behaviour in museums. In their experiment they demonstrated that people in museums are aware of the activity of fellow visitors and often inform their behaviour according to other people's actions. Although this approach, which has roots in behavioural psychology, oversimplifies the social dynamics of the museum setting, it also hints that non–verbal cues are significant resources for museum visitors to understand and engage with the exhibition environment.

2.1.5 Towards an interactional perspective of social conduct in museums

Despite the extensive discussion about sociality in museum visits and the appreciation of visits as situated and context–dependent, details of social interaction during the co–visiting activity have been mainly associated and explored within research that focused on museum learning. As a result, the role of social conduct in the visiting activity is presented as secondary and assistive to the

main cognitive experience of learning during the visit. However, a small number of studies that looked at the interactional qualities of social conduct in museum visits indicated that this area of research may enrich our understanding of how group visitors actively and reflexively configure the museum environment in and through social interaction, e.g. (Hensel 1987; Hindmarsh 2003; vom Lehn and Heath 2003).

Hensel (1987) examined video recordings of family exploration of artefacts and suggested that through talk and interaction members of the groups achieve focus and common alignments towards an exhibit. Their teaching and learning is based on questions and answers that when not facilitated by the exhibit labels lead to disruption of the conversation. Furthermore, members of the group may indicate interest or disinterest to an exhibit through their body posture and orientation. Hensel also pointed out that the rules of conversation as discussed by Goffman (1971) are often altered and broken when the conversation is object oriented (Hensel 1987: 127) and "organisational talk" is often needed to establish and support conversation around objects. The latter will be also discussed in Chapter 8 of this thesis.

Based on observations and audio recordings, McManus (1987) also suggested that there is some correlation between group cohesion and museum behaviour that is connected to learning, e.g. reading of labels, conversations etc. This study offered quantifiable evidence of how different groups of people, adult–only groups included, engage with the museum message. It indicated that group cohesion, i.e. the members' proximity and engagement with one another, has a direct effect on the reading of labels, the engagement with interactive artefacts and the development of discussions. One of her main design suggestions urged museums "to encourage intimate social behaviour by designing exhibits which lead groups to cluster about" and to organise exhibits so that "equal status interactions within the group are possible" (McManus 1991: 39).

In a recent extensive study of visitors' conduct in museums and galleries, vom Lehn (2002) further examined how museum objects are constantly constituted in and through social interaction among visitors. Vom Lehn's research was informed

by ethnomethodology (Garfinkel 1967) and conversational analysis (Sacks 1998), which also underlay Hensel's approach, and utilised videorecordings of visitors to capture the social activity among friends and strangers at the artefact–face. Vom Lehn's study questioned the concept of the attracting power of artefacts and illustrated that the experience of artefacts in a museum is constantly negotiated and re–shaped in and through social conduct. His research also suggested that the detailed inspection of social interaction with and around museum exhibits may contribute towards the evaluation of displays (Heath and vom Lehn 2002) and also offer insights in the design of novel displays that encourage or enable social interaction. Consequently, it informed the design of such displays in the form of art installations, which will be discussed later in this chapter.

The interactional studies of social conduct in museums suggested that research in the production and recognition of social cues by co–visitors may reveal aspects of the visiting experience that are essential for the activity but are not directly related to learning. However, Vom Lehn's investigations, like many other visitor studies, focused on social interaction that happens in and around displays, ignoring effectively social conduct that happens in between displays or on the fringes of the visiting activity. This present investigation builds on the findings of those studies but also expands the work to cover social conduct that happens when co–visitors connect displays together, e.g. through the development of collaborative pace.

2.1.6 Summary

This section offered a selective overview of the way sociality is discussed in museum literature with regard to collocated visitors. It is evident that social conduct is an essential aspect of the visiting activity that influences not only the learning outcome of the visit but also the overall character of the experience. A brief overview of how museum studies perceive and explore the sociality of their remote visitors is now in order.

2.2 Sociality of remote museum visiting

The visitor studies presented so far exclusively deal with visitors who are physically present in the galleries. Visitor studies, and museums in general,

assume the primacy of the physical museum experience and rarely discuss remote visitors as part of it. Remote museum audiences, however, appear to be in the increase and in many cases have outnumbered the people who visit the physical premises of a museum (Lord 1999; Rabinovitch and Alsford 2002)[5]. Despite the increasing number of remote audiences, our knowledge of them is very limited. In similar fashion to the initial behavioural studies in museums, existing studies of remote museum audiences tend to focus on the evaluation of museum websites and the production of statistics of their use. However, limited studies that investigated the social characteristics of web museum visiting indicated that a portion of remote visitors do not visit alone but instead explore the museum material in the company of others (Chandwick 1999; Goldman and Schaller 2004; Semper, Wanner et al. 2000) [6]. According to Goldman's research of six American museum websites, remote visitors who visit with others are most likely to do so with their class, family and friends; in contrast, Chandwick reported that remote visitor groups to the New Mexico Museum of Natural History and Science are more likely to be families. Additionally, he argued that evidence of web use indicates that the way groups of web museum visitors engage with the online museum material may resemble the ways visitors engage with exhibits in the physical premises of the museum. However, this line of research has not been pursued further.

Furthermore, unlike visitor studies of people who physically visit museums, profiling studies of remote visitors do not seem to feature social motivation among the reasons for visiting. According to several web visitor surveys (Goldman and Schaller 2004; Japanese Museum Information 1998; Kravchyna and Hastings 2002; Reynolds 1997; Thomas and Paterson 1998), information seeking and educational purposes are the top priorities for remote visiting. To assess these results, one should weigh up the bias introduced by the survey questionnaires themselves. In most cases surveys of remote visitors are conducted with on–line multiple answer questionnaires, which predetermine and necessarily

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[5] The number of remote visitors is usually based on the calculation of website hits, unique IP addresses and timed sessions.

[6] Semper's survey of the use of museum educational material online indicated that 9% of the online visitors were working with someone else during browsing. Goldman reported 26.3% of online visitors being in groups and Chandwick app. 30% of online visitors being in groups (of which 21% were with their family).

limit the replies of the participants. Additionally, the participant's experience itself derives from the use of current museum web sites that predominantly focus on the organisation and delivery of museum information.

This last claim is supported by a recent study conducted by Loomis and colleagues (Loomis, Elias et al. 2003). This study investigated trends in museum and library web visitation among the general public, as opposed to web visitors only, and indicated that 67% of the participants would use museum websites to share information with friends and family. Furthermore, the Japanese museum information survey (Japanese Museum Information 1998) reported that web visitors in addition to the collections, are interested in 'virtual objects' and 'creative dialogues'.

The need for enhanced experiences for the remote participants has been pointed out by practitioners in the museum field who anticipate that "new media, particularly the World Wide Web, can become a resource that more closely resembles a museum visit than a museum collection" (Borysewicz 1998). Consequently, online visitors will be encouraged "to do more than browse, but also to learn about and experience their [the museums'] artefacts" (Muller 2002). However, technology–mediated sociality among online museum visitors has also been treated with disbelief among museum practitioners as to how effective technology might be without becoming antagonistic with the physical premises of the museum. In an early paper on the use of new media in museums, Shane asked: "Does it [the Web] lend itself to the kind of group interaction so central to a museum experience? Can simulations provide genuine experiences that compete favourably with experiencing real objects with other 'real' people?" (Shane 1997: 193). The next section offers some insight to the overall concern around the use of technologies to support and enable social action and interaction among collocated and distributed participants.

2.3 Social conduct and technological research

Exploration and support of sociality over distance has been an emerging field of research in the computing science literature. This has been broadly driven by the

development of new technologies in the field of networking and telecommunications, but also the realisation that group work activities become increasingly distributed, i.e. they span a number of different members in separate locations, both geographically close and distant. Applications that aim to support distant visiting as an individual or collaborative activity have been deployed in museum settings too. Similar technologies have also been used by artists in installations that have been exhibited in museums. Examples of these applications will be discussed in the course of this section—a series of examples is also presented in Ciolfi and Bannon (2001)—along with technological applications that explored sociality in other settings, both work and leisure related.

The study of sociality of distributed activities has been primarily inspired and extensively supported by research that investigated sociality among collocated users in activities and settings that also involved technologies. Therefore, this section initially briefly discusses the role of social conduct in the use of technologies in collocated activities, museum visiting included. It then introduces issues of social conduct as they are explored in technologies that support distributed activities. Since this thesis is interested in real time distributed museum visiting, the range of technologies and issues discussed is limited to those that appear relevant to real time social awareness and interaction among users.

2.3.1 An increasing interest in the sociality of work and leisure

The interest of technological research in sociality started the last few decades with the study of complex collaborative systems that appeared unsuccessful in the support of the collaborative activities they were designed to facilitate (Heath and Luff 2000). This indicated the need for technological design to move beyond the traditional approach of formal design, that was based on cognitive theories of human computer interaction, to better "*understand,* so as to *better support*, cooperative work" (Bannon and Schmidt 1991). As Luff et al. (2000) pointed out, the "unpicking of how collaborative activities are actually accomplished" can become a resource for reconsideration of both the evaluation and design of technological developments. The research field of Computer Supported Cooperative Work (CSCW) emerged through those concerns and its emergence in computing science effectively acknowledged the "social embeddedness of

technology" (Bannon 2000: 230).

The agenda of CSCW was particularly carried out through an increasing body of research on the social organisation of work settings, the so–called workplace studies. A range of theoretical orientations, from the cognitive tradition, informed the research in workplace studies, and in CSCW in general, such as Distributed Cognition (Hutchins 1995), Activity Theory (Nardi 1996), and Actor Network Theory (Law and Hassard 1999). However ethnomethodology (Garfinkel 1967) and conversation analysis (Sacks 1998) have had the most prevailing influence on workplace studies and social science research in CSCW (Luff, Hindmarsh et al. 2000) and have been extensively used to explore social conduct in the use of technology in particular. This thesis is also interested in the latter, i.e. the practical accomplishment of action and interaction in collaborative activities.

Although workplace studies focus in work settings and activities that are defined by task based action, their findings have also wider application in the research of social conduct in the use of technology. Workplace studies confirmed that naturalistic studies of work settings may be particularly useful in the understanding of work activities as accomplishments of the people involved, and their interactions with each other and the resources available in the local milieu. Furthermore, they drew attention to the situational character of work (Suchman 1987), where plans, rules and formal organisational structures become resources for the accomplishment of the activity, and not abstract descriptors of it. Key elements of these studies included the notion of peripheral awareness as an intrinsic aspect of the accomplishment of work (Heath, Sanches Svensson et al. 2002); the role of objects in the interactional achievement of the activity (Harper and Hughes 1993); and how features of the environment, technologies included, are constituted as interactional resources through gesture and talk (Goodwin and Goodwin 1996; Hindmarsh and Heath 2000).

Initially workplace studies were carried out in safety critical settings, such as air traffic control rooms (Bentley, Hughes et al. 1992; Hughes, King et al. 1994), the London underground, e.g. (Heath and Luff 1991a), and a range of medical settings, e.g. (Fitzpatrick and Kaplan 1997; Hartswood and Proctor 2000;

Hindmarsh and Pilnick 2002; Randell 2004b). However, research in similar fashion has also been expanded to cover other working environments such as secretarial work (Clement 1990), design activities (Büscher, Kramp et al. 2003), library work (Twidale, Nichols et al. 1997), as well as use of mobile phones (Murtagh 2002) and tourist activities (Brown and Chalmers 2003).

Issues initially developed in workplace studies were also explored in the design of social technologies in museums. This was additionally triggered by concerns—and suspicion—expressed among museum professionals with regard the negative effect of the introduction of audio guides on the sociality of museum settings, in particular the decrease of talk (Martin 2000; Walter 1996). The Sotto Voce guidebook project by Xerox PARC used conversation analysis to study the use of guidebooks in museums, and it defined the conversational role of such devices in visitor's discussions (Woodruff, Szymanski et al. 2001). Subsequently it designed an electronic guidebook that afforded eavesdropping among the participants: pairs of visitors explored a historic house at their own pace while they remained aware of each other's choices of commentaries. The study of the guidebook with users suggested that informal access to one's companions' engagement with the content of the exhibition created a sense of connection among the visiting parties, informed natural and rewarding forms of conversation, facilitated group cohesion and supported increased awareness of the rooms and their content (Aoki, Grinter et al. 2002).

Furthermore, a series of art installations that also incorporated technological elements, within the SHAPE project (www.shape-dc.org), were informed by findings from interactional research in social conduct among museum visitors and explored ways of supporting social interaction among friends and strangers alike. The studies of two of these installations, Deus Oculi and Ghost Ship, confirmed that the conduct of museum companions "is carefully designed with regard to the concurrent and prospective conduct" of each other (Heath, Luff et al. 2002). Among the design sensitivities that were articulated in this work, the need for creating opportunities for interaction and also support for sustained interaction through the inclusion of flexible and open–ended resources were pointed out (Hindmarsh 2002). The latter will also appear in the discussion of mixed reality

museum environment in this thesis.

The following section looks at how technological developments, often informed and inspired by issues of collocated social conduct, has accommodated the sociality of distributed activities.

2.3.2 Support for distributed activities

Research into the sociality of work activities has shown that work does not only happen in focused encounters but also in informal encounters that happen in the periphery of the main activity. These encounters, however, despite being informal in nature, facilitate the activity and make work happen. This notion of unplanned encounters in combination with developments in technology, especially video and audio transmission, gave ground to a series of experiments that sought to support real–time distributed communication among members of a group so as to afford casual social interaction. A series of technologies and combinations of them were explored, such as media spaces, collaborative virtual environments and mixed reality environments. In the late 1980s and early 1990s, this topic of research was particularly expressed in the development and the extensive study of media spaces (for example (Bly, Harrison et al. 1993; Gaver 1992; Heath and Luff 1992a; Mantei, Baecker et al. 1991)).

Media Spaces

The term *media spaces* was initially used by Stults (1986) in Xerox PARC to describe:

> An electronic setting in which groups of people can work together, even when they are not resident in the same place or present at the same time. In a media space, people can create real time visual and acoustic environments that can span physically separate areas. They can also control the recording, accessing of recorded images and sounds from those environments.

Media spaces involved the video–audio connection of offices and communal rooms (Dourish and Bly 1992) as well as the longer term connection of offices (office shares) of distributed colleagues (Dourish, Adler et al. 1996). Recently, audio–only media spaces were explored with regard to their support of social

interaction and awareness (Ackerman, Hindus et al. 1997). Media space technology differed from other systems that supported distributed work activities, such as video conferencing, e-mail etc., in the fact that the technology was always available to the connected users and therefore it afforded social interaction and communication beyond the defined tasks that are associated with specific work activities. Furthermore, media space technology, apart from support for some straightforward communication and collaboration in between participants, also explicitly supported awareness of others in the form of *glances* and instantaneous connections with remote nodes (Gaver, Moran et al. 1992).

Studies of media space installations suggested that communication among remote colleagues had increased, especially informal, unprompted interactions that did not occur before (Dourish and Bly 1992). Participants used the technology to locate their colleagues, monitor activity in the common rooms and exchange everyday light discussion along with carrying out more formal meetings and activities around projects (Bly, Harrison et al. 1993). Furthermore, the lightweight co–presence that was afforded by the system allowed individuals to concentrate on their primary job while remaining available to one's colleagues, or handle more than one task at the same time (Heath and Luff 1992a).

Unlike the positive effect of media space technology on participants' awareness of each other and informal communication, the asymmetries introduced by the system in the video–based aspect of the communication were criticised for inhibiting purposeful interaction among colleagues and around the sharing of objects (Heath and Hindmarsh 2000; Heath and Luff 1991b, 1992a, 2000). These critiques were based on direct comparisons of video–based communication to face–to–face communication, and suggested that the limited view of the camera did not support common alignment of the participants towards objects in their environment and rendered gaze and gesture insignificant with result the breakdown of conduct—the latter was also reported by (Mantei, Baecker et al. 1991).

Beyond the initial critiques and the appraisals of different aspects of media spaces, a series of findings from a longitudinal use of the technology over three years

appears particularly relevant to this present investigation. Dourish et al. (1996), reporting on their own experiences with an office share, suggested that "face–to–face communicative behaviour in the real world is not always an appropriate baseline for the evaluation of mediated communication". They also added that use of the technology changes as familiarity increases and that the importance of such technology extends beyond the individuals that are directly engaged with it. Observations of how people adjust their verbal behaviour to indicate availability for social interaction (Ackerman, Hindus et al. 1997), how the perception of gaze alters over long use, and the effects of the use of the system on neighbouring offices (Adler and Henderson 1994), as well as the use of the private offices by individuals other than their owners, supported those claims.

Collaborative Virtual Environments

Similar goals of supporting remote exchange of information and social interaction, but based in a spatial metaphor and the use of 3D graphics technology, triggered the development of collaborative virtual environments (CVEs). Unlike media spaces, which were based in the video and audio connection of existing physical settings, CVEs "represent a shift in interacting with computers in that they provide a space that contains or encompasses data representations and users" (Snowdon, Churchill et al. 2000: 5); the latter in the form of avatars. A range of CVEs have been deployed to support both work and leisure—some of them have also been installed as displays in museums (Büscher, Hughes et al. 1999; Büscher, O'Brien et al. 2001). CVEs have been particularly popular in the gaming industry and in the form of persistent multi–player collaborative environments such as *Active Worlds*, *There* etc. Although CVEs are usually imagined spaces, researchers and artists have also experimented with three–dimensional representations of existing cities as surrogate spaces to the physical ones (Nielsen 2002).

A great deal of studies have been done of the social aspects of CVEs, looking at different themes, such as presence and co–presence, social conduct and virtual communities, for example (Churchill, Snowdon et al. 2001; Schroeder 2002). This thesis has particularly benefited from research done with regard to the resources people use for their conduct in CVEs. On this topic, Bowers et al. (1996)

indicated that behaviour of avatars and their trustworthiness to represent the status of the user is crucial in the maintenance of order in a meeting situation, and the successful coordination of action and interaction among participants. Furthermore, the fragmented view of the environment and avatar gestures also proved to be problematic in the collaborative manipulation of objects in CVEs, since the limited view hindered participants' capability to successfully align themselves towards the same object or match a gesture with its referent (Fraser 2000; Hindmarsh, Fraser et al. 2001). Those findings were also reported in longitudinal studies of CVEs, which additionally indicated that structured activities appear to be more fitted to the medium than unstructured (Nilsson, Heldal et al. 2002). A remedy for the latter would be the availability in the environment of resources, in the form of manipulable objects (Brown and Bell 2004) or interesting features of the built environment (Pettifer, West et al. 1999) that could be used by participants to do collaborative activities or initiate discussion.

The spatial orientation of virtual reality and CVEs has been particularly attractive to museums. According to Thomas (1998: 16), "museums occupy fixed geographic addresses. They define real spaces, real galleries inside their walls. This is what draws visitors to museum". Therefore, museums have utilised several techniques to present their space to remote visitors through Quick Time Virtual Reality technology (QTVR), panoramic photographs and immersive virtual reality. Two particular applications used CVE technology to further support sociality within the 'virtual' space of the museum[7]: the virtual tour on the website of the Van Gogh Museum[8] and the Virtual Leonardo project[9]. Both applications used 3D graphics and chat technologies to support synchronous remote visits among distributed online visitors. Each visitor was represented inside the environment by an avatar and s/he could navigate around the environment, access information about artefacts and interact with friends and strangers. In Virtual Leonardo, remote visitors were also able to manipulate objects that were off–reach for local visitors.

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[7] CVE technology has also been used for the development of learning resources based on museum collections (Economou, Mitchell et al. 2001). However, this research does not appear to draw any conclusion with regard to sociality and museum settings.
[8] The Van Gogh Museum, The Netherlands (http://www.vangoghmuseum.nl).
[9] This project is based on the collections and the building of the Museum of Technology and Science, Milan, Italy, (http://www.museoscienza.org).

One of the intentions of Virtual Leonardo was to look at the social aspects of the remote visit. Therefore the application prompted the visitor to set an appointment with a remote friend (in a separate workstation) before s/he logged on. The evaluation, however, of the project focused on the technical and usability issues of the system (Barbieri and Paolini 2000). Limited analysis of conversations that took place in the system indicated that guided tours generated more talk about the artefacts as opposed to discussions regarding the users' whereabouts and the system's functionality, which reportedly dominated discussion during free browsing. On the other hand, the collaborative virtual tour of the Van Gogh museum has not been evaluated yet (Verhoeven 2003) and despite the fact that the opening page of the tour generates a great deal of interest from web visitors, the effect of the application on a social visit online is unknown.

Mixed reality technologies and mobile mixed reality games

The combination of the spatial metaphor used in CVEs with aspects of physical and synthetic environments evident in media spaces and VR in one collaborative event has triggered the exploration of another form of technology that aims to support collaboration and sociality among distributed participants, mixed reality (Benford, Greenhalgh et al. 1998). As far as social activity is concerned, mixed reality technologies aim to establish collaboration and social interaction that span both local and remote environments, which stand for existing physical environments and synthetic CVEs respectively. This is achieved by channeling audiovisual activity from one environment to another via projection technology.

Mixed reality installations have been used in limited exploratory and experimental settings (Koleva, Schnädelbach et al. 2001), and performances, such as inhabited TV programmes (Benford, Greenhalgh et al. 1999). As a result, issues of social conduct have not been explored in the detail that was observed in technologies discussed previously. For example, vom Lehn (2002), in the study of social conduct in Desert Rain mixed reality performance, focuses on two aspects of sociality, the social conduct of the participants inside the CVE, with findings similar to the ones discussed in the previous section, and the organisation of conduct from the point of view of the performers. Benford et al. (2000), in the study of a mixed reality poetry performance, additionally remarked that there was

little social conduct observed between the remote audience and the local audience and poet, and that the former appeared to ignore the latter and the overall convention of the performance. This issue will be further explored in Chapter 7 of this thesis.

Mixed reality technology has been also deployed in the art installation *The Difference Engine #3* by Lynn Hershman (Hershman) in ZKM Media Museum in Karlsruhe. The installation bridged the physical and digital by offering views of the virtual museum environment to local visitors and views of the physical environment to remote visitors. A chat channel was also used to support message exchanges among visitors. In this respect, *Difference Engine #3* offered local and remote visitors the opportunity to simultaneously interact with the same piece of 'digital sculpture', and also introduced and encouraged social awareness and interaction beyond the physical walls of the museum. It also attempted to explore issues of museum memory by storing the avatars of the visitors in a virtual 'purgatory'. However, visitors' perception and use of the installation has not been studied (Buddensieg 2002).

The experimentation with mixed reality technologies and its combination with mobile technologies and ubiquitous computing have given rise to what is tentatively called mobile mixed realities, an emerging strand of technological research that has been particularly deployed in game situations and performances (Benford, Flintham et al. 2004; Björk, Falk et al. 2001; Flintham, Benford et al. 2003). In these settings, mobile mixed reality technologies aim to enable and encourage interaction among people in very different contexts. Furthermore, the differences in the participants' contexts become elements of and resources for participation in the game or the performance. The mixed reality museum environment that was studied as part of this current investigation also belongs to this category, with the difference that participants do not take part in a staged activity/performance but are invited to share a museum exhibition.

Robotics

Following a different strand of research to what has been presented so far, a series of European funded projects have combined the concept of a shared museum tour

with robotics, to create robot tour guides for both remote and local visitors. In the Tourbot project (Trahanias, Burgard et al. 2003), a robot guided local and remote visitors around museum exhibitions while offering web visitors real time views of the galleries. Both audiences collaborated in the selection of tours through a voting process. In that respect the two otherwise isolated audiences were treated as equally important in the shaping of a museum tour. Although awareness among on–site and on–line visitors was afforded, direct interaction through the system was not supported. Furthermore, on–site visitors were aware only of the tour preferences of their remote co–visitors whereas on–line visitors could also get a glimpse of the on–site participants through the eyes of the robot. The evaluation of the application, once more, prioritised the technological and usability aspects of the system while underemphasising the social and interactional effect on the visit.

2.3.3 Summary

This section presented technological research that is concerned with the role of social conduct in the everyday activity of groups of people. It particularly focused on those technologies that support distributed social activity and it presented examples from both museum settings and work environments. The review prioritised studies that offer insight in the achievement of social conduct in and through the given technology. This section suggests that despite the wealth of studies of social conduct in collocated and distributed work activities there is limited research in the way collaborative technologies might be used for distributed leisure activities. This thesis aims to contribute to this particular field of research.

2.4 Discussion

This chapter argues that in recent years there has been an increasing interest, in both museological and technological research, in the study and understanding of the social aspects of the visiting activity and of the use of technology. Different aspects of social conduct have been prioritised by researchers in the two fields. Museological research, particularly visitor studies, has mainly focused on the ways social interaction may support learning. However, a small number of studies that looked at the interactional aspects of social conduct in co–visiting, indicated

that there is scope for further research in the area, especially with regard the role of social conduct in parts of the visit that do not happen at the exhibit–face. Sociological studies of work environments, on the other hand, have prioritised an ethnographic and ethnomethodological approach to the investigation of social conduct in technological settings. These two strands of research have a bearing on this current investigation, both in terms of its motivation and its methodological orientation.

Furthermore, CSCW research has been experimenting with the development and the study of technologies that support distributed activities. This chapter particularly focused on real–time distributed activities. Although the majority of those studies involve work settings, they offer useful insights on how awareness and direct interaction among distributed participants may be supported and challenged through technology. Similar technologies have also been explored in museum settings. However, their development and study have been mainly triggered by technological concerns or were products of artistic endeavours. As a result, there is very limited knowledge of the effect of these technological applications in the sociality of the overall distributed visiting activity. This thesis focuses in particular in the latter by investigating the production and recognition of social conduct among distributed companions in the course of visiting activities in an experimental mixed reality museum environment.

The small number of museological–based research and technological initiatives that explore ways of enriching remote museum visiting with aspects of social and personal context, that otherwise are considered intrinsic elements of collocated visits, can partially be explained due to museums' preoccupation with the materiality of collections. Although museums have been characterised as "fertile ground for studying visitor behaviour and envisioning systems to enhance visitor experience" (vom Lehn, Heath et al. 2001) and have fostered extended technological experimentation in museum settings, in the form of both long–term applications and short term prototype–based sessions, technology mediated sociality among distributed visitors has faced the disbelief of museum practitioners.

One of the museological concerns about networked, distributed technologies is the question of how effective technology might be without becoming antagonistic with the physical premises of the museum. Another is the affirmation that "a virtual visit to a museum is fundamentally a media experience, not a museum experience" (Mintz 1998). The latter reflects existing museological beliefs, which primarily focus on the role of physicality of artefacts in the visiting experience and that treat remote museum visits as secondary or surrogate experiences to the traditional ones, prioritising the unmediated experience of the museum object—"the real thing"—over the mediated experience via technology. Museum website designers, on the other hand, appear divided as to whether to provide genuine online visitor experiences or instead encourage and support physical visiting (Cunliffe, Kritou et al. 2001).

This is not to say that the appreciation of museum artefacts is not a central aspect of distributed visits too, or that the support for social interaction may be enough for a rewarding distributed museum visit. This thesis appreciates that museum artefacts are a fundamental element of the visiting activity and, in that respect, distributed co–visiting does not directly compare to informal social interaction over media spaces or sharing of objects in distributed collaborative work environments. In distributed co–visiting there is a particular weight on the on–site visitors being *local* and the on–line visitors being *remote*. This thesis, however, does not address the issues around museum artefact representation. It rather looks at the relation among local and remote visitors from the point of view of visitors' interaction. It investigates social interaction among friends in museums, and how social conduct may blur the boundaries among local and remote, and may foster shared experiences for combined on–site and off–site audiences, that may take advantage but additionally go beyond the materiality of the collection.

This investigation pursues an approach based on naturalistic observations of co–visiting activity *in situ*. By looking in detail at what groups of visitors do in the galleries, it seeks to understand the elements that make a museum visit involving a number of individuals into a shared museum experience. This approach reflects the importance of the situated and context–dependent character of the museum visit, as indicated by various visitor studies. It is also in line with the exploration

of sociality in workplace studies and current mixed reality applications for leisure. Moreover, this research expands the existing approaches to studying social interaction in museum visits, by looking at conduct and interactions that happens beyond the artefact–face, in the management of the visit and the ways co–visitors constitute and maintain the order of the visiting activity. It also explores the role of other social cues, beyond verbal communication, in co–visiting. Furthermore, it treats fieldwork from collocated and distributed visiting activities as complementing each other—instead of being strictly compared to each other—towards an informed understanding of social conduct in either of the two activities. It is anticipated that a deeper understanding of the social character of the museum visit may then offer useful insights into the design of technology that attempts to fill the space of social synchronous experiences among local and remote visitors.

Overall, this thesis presents an explorative investigation of museum co–visiting as it may be supported by mobile mixed reality technology. It works on the assumption that the support of sociality among distributed visitors may open up opportunities for rewarding visiting experiences for those who may not have the advantage to visit the physical premises of a museum. It also anticipates that the introduction of technology may alter the activity for all participants involved, both local and remote. The topic of this thesis has been approached through the appreciation of three factors: that the studies of social conduct among collocated visitors, and the issues that they highlight, may provide a point of reference for investigating co–visiting among distributed visitors; that the ways in which current technological developments may affect and support visiting activities is largely open territory; and that investigation into the ways that social conduct happens in and through new technologies will be essential to supporting emergent distributed museum experiences.

2.5 Conclusion

This chapter offered a selective overview of how sociality is discussed in museum studies and technological literature. Theoretical approaches, results of studies, specific technologies and their evaluation were presented to illustrate points of

interest in current research with regard to social conduct and its role in the use of technology in collaborative activities. An argument for an interactional approach to studying sociality in collocated visits was put forward, on the basis of existing limited research in the field and in the light of socio–technological research that has explored social conduct in distributed activities mediated by technology. The main aim of the research, to explore the social organisation of non–collocated museum visits through the complementary discussion of collocated and non–collocated visits, was outlined. The following chapter describes the settings in which the empirical investigation of this research took place.

3 | Overview of settings

The previous chapter presented the wider field of this research as well as the particular focus of this thesis. It also indicated the emphasis of this research in investigation of social conduct among co–visitors *in situ*. The purpose of this chapter is to offer an overview of the settings where the empirical part of the research took place. This will help the reader to appreciate the scale and atmosphere of the environments where the fieldwork took place. It will also support one's orientation in the discussion of incidents. Furthermore, the presentations of the settings in this chapter will facilitate the explanation of research techniques that will be discussed in the following chapter.

The description of the settings will also familiarise the reader with the way terminology is used in the presentation of data within the thesis. Overall, the terms artefact, display and exhibit are used in this thesis with reference to designed elements of the exhibition, whereas, the term object is used to describe other items such as handheld devices, audio guides and so forth. Moreover, the term display in most cases refers to an assembly of artefacts and interpretation media such as information panels, touch screens, labels and so forth, which explore one topic. For example, in the Mackintosh Interpretation Centre, the topic of the *Willow Tea Rooms* is presented as one display with original objects, graphics, labels, touch screens and video screens incorporated in one installation. In the House for an Art Lover, a whole room or large parts of a room may be regarded as a single display since there are no distinguishable individual exhibits. Furthermore, artefacts and architectural features of a room are often grouped together in one audio commentary. The same use of terms applies also to the discussion of data from the distributed visits.

3.1 Settings of collocated visits

The study of collocated visitors took place in two settings in Glasgow, The House for an Art Lover (www.houseforanartlover.co.uk) and the Mackintosh Interpretation Centre in The Lighthouse, Scotland's Centre for Architecture, Design and the City (www.thelighthouse.co.uk). The descriptions that follow reflect the status of the setting as it was during the period of the studies.

3.1.1 House for an Art Lover

The House for an Art Lover (hereafter House) is a newly built house, based on a 1901 entry to a design exhibition by Charles Rennie Mackintosh, the Glaswegian architect, artist and designer. The visiting area spans three levels. The building sits on a hill so it has two ground level floors and a mezzanine. The exhibition space covers the upper ground floor and the balcony on the mezzanine. The shop and café are situated on the lower ground floor. In the weekends and during summer holidays, the access to the exhibition area is through the main entrance of the building, which is situated on the upper ground floor. During weekdays the access to the exhibition area is through the shop entrance, which is situated on the lower ground floor. The internal access to the upper ground floor is through a steep narrow staircase and a lift limited to people with mobility difficulties. The exhibition area is comprised of nine defined spaces on the upper ground floor, the *Entrance*, the *Main Hall* (fig. 3.1), the *Dining Room* (fig. 3.2), the *Music Room* (figs. 3.3–4), the balcony of the music room, the *Oval Room* (fig. 3.5), the Margaret MacDonald[10] interpretation area, the audiovisual room, and an internal balcony on the mezzanine. A general–purpose garden, that hosts sculpture exhibitions, a wall flower garden and a children's playground comprise the grounds of the House.

Figures 3.1-4
House for an Art Lover: the Main Hall, the Dining Room, the fireplace and the piano in the Music Room

Images 3.1, 2, 4
©House for an Art Lover

[10] Margaret MacDonald was the wife of C.R. Mackintosh. She was an artist and designer and she designed a lot of the interior features of the House for an Art Lover.

Figures 3.5-6
House for an Art Lover: the Oval Room, and the audio guide

Image 3.5
©House for an Art Lover

The House for an Art Lover functions as a heritage attraction and is open for public visiting throughout the calendar year. It is also a popular venue for private functions during which it closes for the general public.

There is an admission fee for the House that people pay upon entrance. During weekdays, the admission fee is paid on the lower ground floor at the counter of the museum shop. During these days no attendants are present in the exhibition area on the upper floors. In the weekends, the admission fee is paid on the upper ground floor at a purpose built desk in the *Main Hall*. During these days one member of front–of–house staff is permanently located on the floor. Along with their ticket, visitors also get a threefold informative leaflet about the venue as well as an audio guide (fig. 3.6) that gives access to pre–recorded commentaries about the history of the building and selected architectural and decorative features. The attendants explain the functionality of the audio guides as they hand them out to visitors. The explanation of the features of the audio guide does not happen strictly on an individual level; often, in group visits, the features are demonstrated to the whole group or to one member of the group, who subsequently informs the rest of the companions.

The exhibition area includes the house rooms, decorated and furnished according to Mackintosh's and MacDonald's interior designs. All the objects can be handled but there is no sign to prompt visitors to do so. The architectural drawings of the House are displayed in the internal balcony on the mezzanine and they are accompanied by introductory panels. The Margaret MacDonald interpretation area includes interpretive panels and small objects in museum cases to present the traditional techniques used in the making of furniture and the rest of the

decorative features of the House, e.g. gesso panels[11] and stainless glass. A three dimensional architectural model of the building is also on display. In the audiovisual room visitors can watch a video about the history and the development of the overall project which runs on a loop. The two interpretation rooms are separated from the rest of the exhibition space by swing doors.


Figures 3.7-9 House for an Art Lover: commentary index in the Music Room, information panels in the Dining Room and in the Main Hall

The audio commentaries cover all rooms in the house apart from the two interpretation areas. Visitors are prompted to return the audio guides in a designated box situated inside the swing doors before they leave the exhibition area. The index of the audio commentaries with the numbers and the featured themes is presented on a stand–alone card in the entrance of each room (fig. 3.7). Despite the sequential numbering of the commentaries (from 1 to 21), their actual content does not follow a linear story so that the commentaries can be effectively listened to in any order. Each commentary varies in length and quality but typically they are very lengthy (2 or more minutes each) and they are comprised of narrative combined with excerpts from interviews with Mackintosh experts. The length and the poor quality of the sound in the audio commentaries is one of the main sources of critique by the visitors—as indicated in a visitor survey conducted by the attraction's marketing department. Apart from the audio guide and the leaflet, interpretive material is available on stand–alone panels (usually at the room corners) with brief text and/or images about local aspects of the room (figs. 3.8–9).

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[11] Plaster of Paris, or gypsum, especially as prepared for use in painting, or in making bas–reliefs and the like; by extension, a plaster–like or pasty material spread upon a surface to fit it for painting or gilding, or a surface so prepared.

3.1.2 Mackintosh Interpretation Centre

The Lighthouse, Centre for Architecture, Design and the City is located in the refurbished Glasgow Herald Building, initially designed by Mackintosh. It is a multi–purpose centre which hosts a variety of temporary exhibitions on design and architecture. It also fosters entrepreneurship in the field through its schedule of seminars and workshops and its collaborations with creative industries in Scotland. Additionally, it supports educational activities for a range of ages and educational groups. The Mackintosh Interpretation Centre (Mack Room) is situated on the third floor of the building, with access to the Mackintosh tower. The exhibition space is organised in two fairly distinctive areas: the entrance with the gallery assistants' desk, the shop and general information about Mackintosh's buildings (fig. 3.10), and the main interpretation area with displays on several aspects of his work as well as the more general historic and artistic context of that period (fig. 3.11).

Figures 3.10-11 The Mack Room: the entrance side of the gallery and the main interpretation area

The two areas are separated by a tall glass partition. The side of the partition in the main interpretation area displays a *Timeline* of Mackintosh's work and life alongside significant events of that period. The exhibition space on the entrance side of the gallery contains an introductory strip with all Mackintosh's buildings (seen on the right of fig. 3.10). At the bottom of the room, a model of The Lighthouse and a drawing cabinet are displayed in a case. Information associated with this display can be found on the partition glass wall. The main exhibition area is thematically organised in a series of topics, such as 'Paintings and Drawings', 'Glasgow School of Art', 'Willow Tea Rooms' and so forth (fig. 3.12). Each theme is presented through an assembly of original artefacts, touch

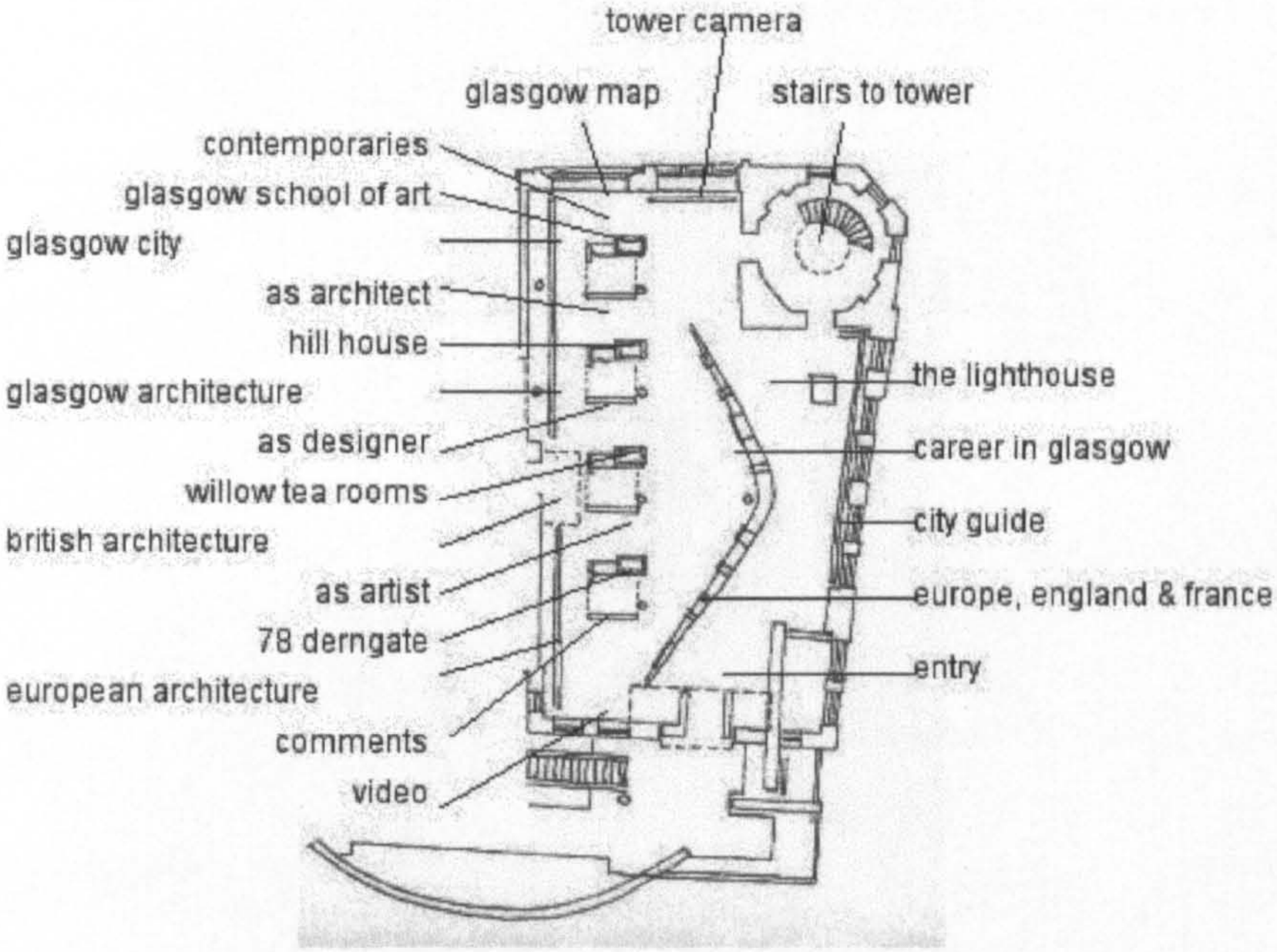


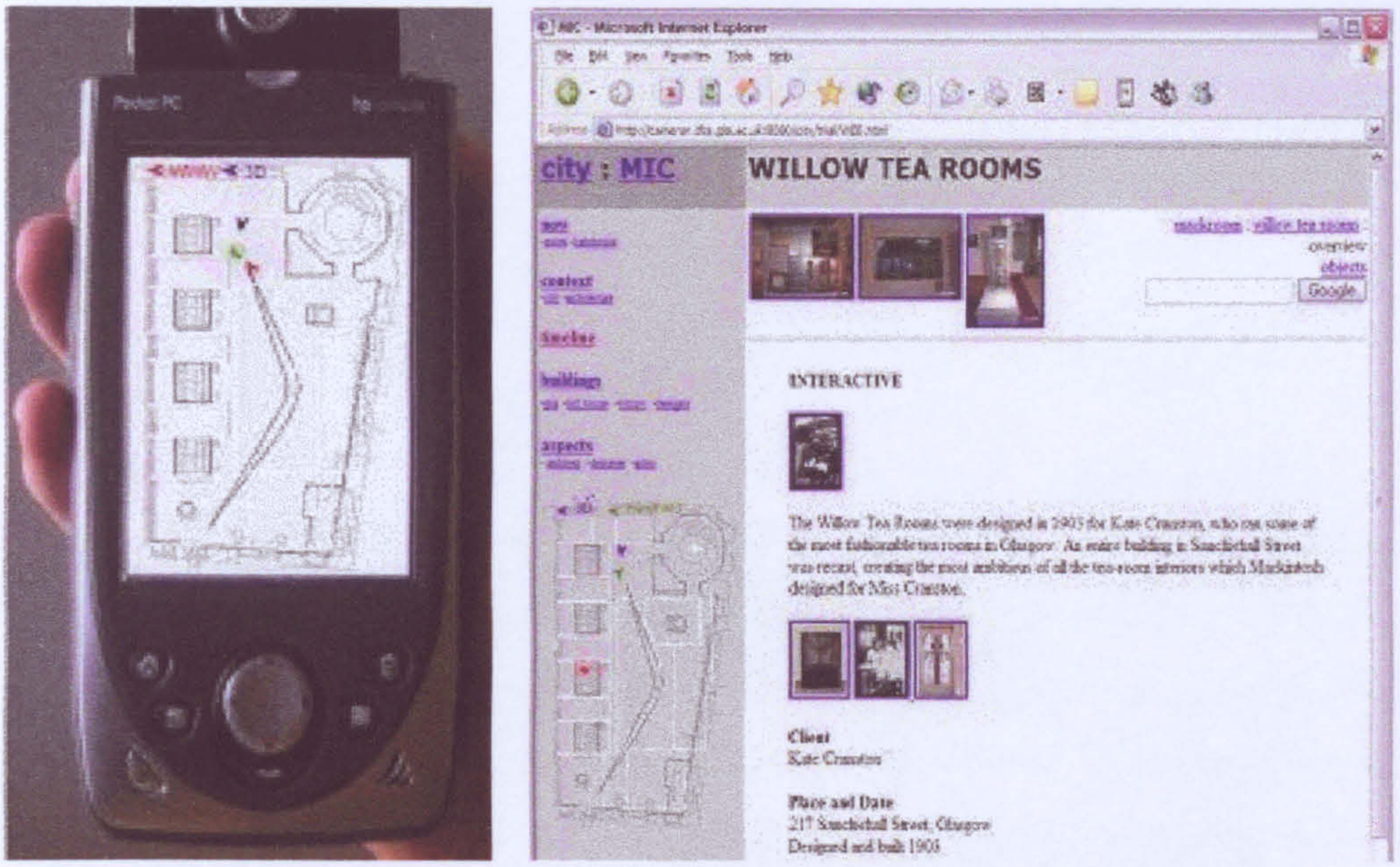
Figure 3.12 Architectural drawing of the Mack Room with provisional thematic areas of the exhibition (*Image 3.12 ©The Lighthouse)*

screens, video screens and display panels with text and images. Eighteen screens (touch screens and video screens) are present in the exhibition space. The displays also include 'discovery drawers' with extra material (mainly architectural drawings), the *Timeline* wall (seen on figs 3.11-12), and the viewing monitor and controls of a CCTV camera mounted on the tower of the building that offers views of the city. Replicas of chairs can be handled and used by visitors. This, however, is not indicated in the gallery.

There is an admission fee for the Mack Room that visitors pay at the main reception on the ground floor. The gallery assistant on duty also checks the ticket and in some cases offers a brief overview of the gallery and the tower. An information sheet with details of the buildings that can be seen from the top of the tower is also available for visitors to use during their visit. Leaflets from other Mackintosh venues are also available for people to take with them. The Mackintosh Room is open to the public every day.

3.2 Setting of distributed visits

The *Mack Room mixed reality environment* was designed for a specific exhibition: the Mack Room in The Lighthouse. The system aimed to support simultaneous



Figures 3.13-14 Mack Room mixed reality system: the handheld device with the display of the floor plan, and aspect of the hypermedia environment with the floor plan and museum content

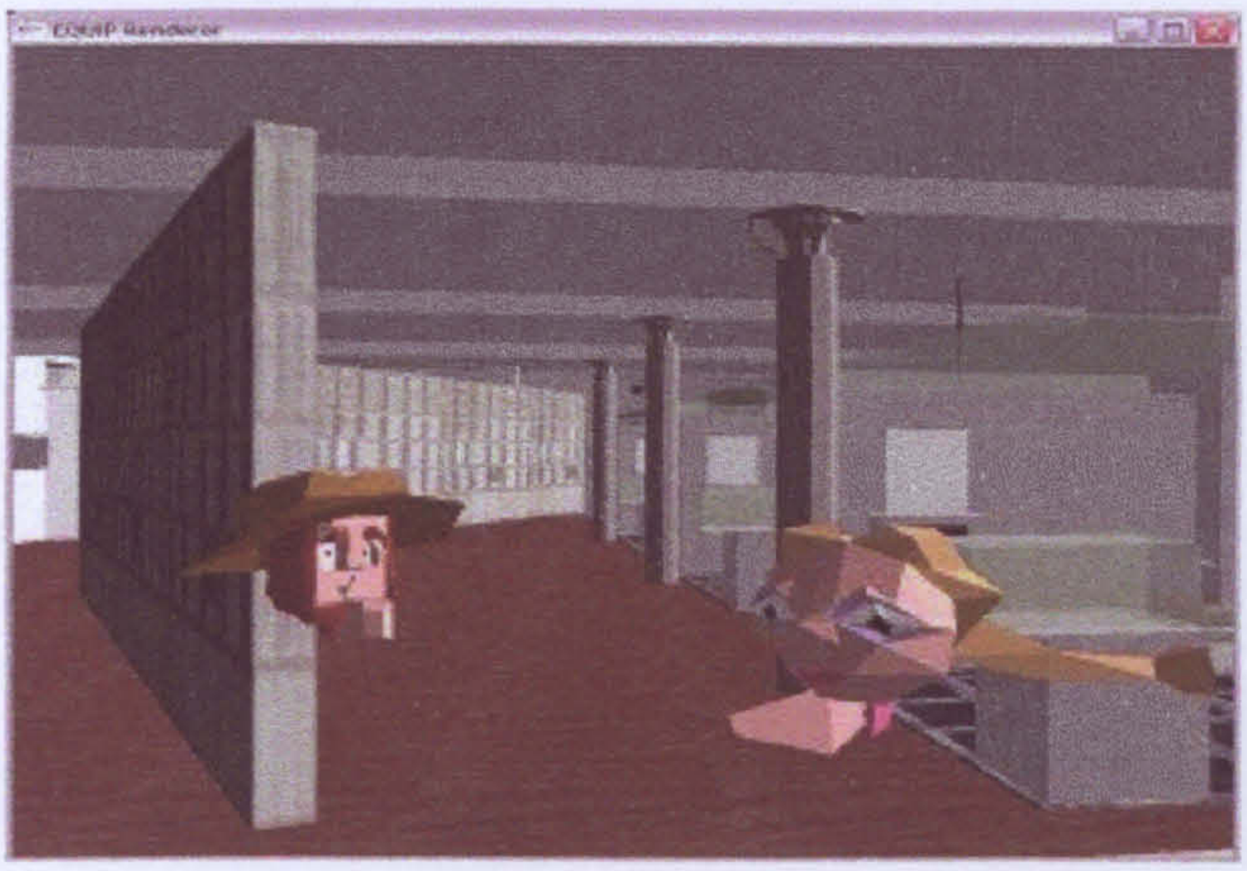


Figure 3.15 Mack Room mixed reality system: the gallery and the avatars of the hypermedia participant (left) and the local participant (right) as seen by the VE participant

visiting of the Mack Room by at least three participants. One of the participants was in the gallery and the other two were in separate locations inside the building. The two off–site participants used two different environments: a hypermedia–only environment and a virtual environment (VE) combined with hypermedia.

The on–site participant carried a handheld device (Hewlett Packard iPAQ) that was location–aware and displayed the ongoing positions of all three visitors on a map of the gallery (fig. 3.13). The local participant was represented by a green blob with an encircled arrow to indicate the orientation. The VE participant was represented by a blue arrow and the hypermedia participant by a red arrow. The

tracking of the device was done through ultrasound technology (Randell and Muller 2001) that was installed in the gallery. No additional content was delivered to the handheld device and no direct interaction with the device was required to operate it. Effectively, the hand–held offered to the local participant an electronic version of the floor plan with the additional information of all participants' current location.

The hypermedia participant used a desktop with a standard web browser with an applet that displayed the gallery map (fig. 3.14). It also displayed information about the exhibition as it will be explained later in this section. All participants were represented on the gallery map by different colour icons and their locations were updated upon movement. The hypermedia participant was represented by a red blob with an encircled arrow to indicate orientation. The on–site participant was represented by a green arrow and the VE participant by a blue arrow. The hypermedia participant could move his/her representation by simply clicking on the map. Upon clicking, the position of the red blob was instantly updated to reflect the action of the user. A list of links to the content of the

The VE participant used a laptop that displayed a first person[12], 3D model of the Mack Room with avatars representing the other visitors (fig. 3.15). The on–site participant was represented in the VE by a head–only avatar which had blond pigtails (seen on the right of fig. 3.15) and the hypermedia participant was represented by a head–only avatar which had a brown hat (seen on the left of fig. 3.15). The VE participant could move around the environment by using the arrow keys on the keyboard. Information about the content of the exhibition was also available in a separate window as it will be discussed later in this section. The VE participant did not have a map of the gallery in his/her availability.

All the devices were connected via a wireless communications network that was installed in The Lighthouse and they were coordinated through Equator's shared tuple space infrastructure, EQUIP (MacColl, Millard et al. 2002). All participants shared an open audio channel that was always on. Apart from the volume control,

[12] I.e. no representation of the user was included in the VE.

no other interaction with the audio features was available in the system. The on–site participant wore a pair of wireless noise canceling headphones and a separate clip–on microphone. The two remote participants wore off–the–shelf headsets that combined a single earpiece with a microphone.

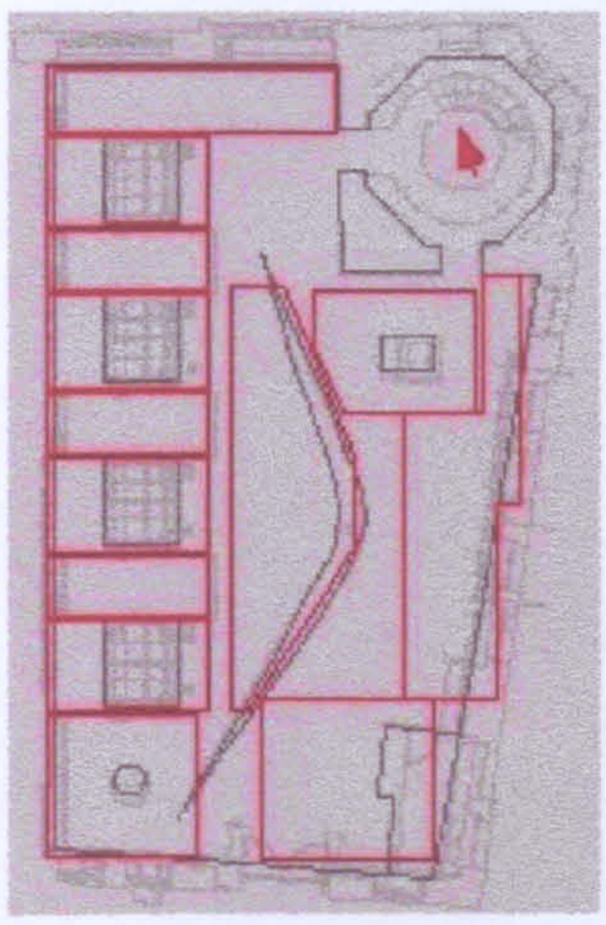


Figure 3.16 The information zones in the Mack Room mixed reality environment

As has already been mentioned, the system also supported multimedia information for the off–site visitors in the form of web pages. The web pages were delivered on a standard web browser window. Information was dynamically updated and presented upon movement in the map or VE. The hypermedia participant could also navigate the content of the gallery from a list of links (shown on the top left corner of figure 3.14). The information on the web pages was delivered through text and images. The text was often a copy of the text on graphic labels and panels in the gallery. The images include both close–up images of artefacts as well as more general aspects of thematic areas in the gallery. The actual content was similar but not identical to the information presented on labels and panels in the gallery, for example the content of the touch screens was not available to the off–site visitors[13]. Additionally, in the time between the implementation of the environments and the actual user trials, changes occurred in the environment of the physical premises of the gallery that were not reflected in the off–site environments.

The automatic presentation of information schematically followed the spatial organisation of the exhibition, so that all visitors were able to 'look at' the same display when in the same location. This was afforded by the segmentation of the gallery map and 3D model into information zones (fig. 3.16) according to the thematic topics of the exhibition. In that respect the system supported interaction around corresponding exhibition displays in the Mack Room and in digital form.

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[13] The decision not to include the touch–screen content on the off–site information was influenced by the unavailability of the content in the right digital format, the sensitivity of the Institution regarding copyright issues and the limitations in the project's time to resolve the above issues.

3.3 Conclusion

This chapter reviewed the settings of the studies with regard both the physical organisation of space and the content of the exhibitions. Aspects of the system that was used in the Mack Room mixed reality user trials were also presented in some detail. The chapter further introduced and explained the use of specific terms in the descriptions of the settings and the discussion of the fieldwork. The following chapter discusses the methodological approach to the research that supports this thesis.

4 | Methodological approach

Chapter 2 looked at the various approaches that have informed the study, understanding and support of social conduct in everyday activities and work, both in museological and technological research. Chapter 3 presented the settings of the empirical investigation. This chapter will further focus on methodological issues regarding the study of social contact in a museum setting. In particular, it will present the methodological challenge of studying sociality in group museum visits among collocated casual visitors and among non–collocated visitors who participated in an experimental mixed reality museum environment. For the purpose of this research, ethnographic methods were used for the capture of the data and notions drawn from ethnomethodology informed the analytical orientation.

The visitor studies discussed in Chapter 2 identified museology's interest in the social aspects of group visiting, but also indicated that there is limited knowledge regarding the sociality of the visiting activity and especially how a shared visit is shaped through social conduct. Falk's (1985) studies had shown that members of a group might spend the majority of their visiting time in engaging with the exhibition and a constant 15% of their time in attending to each other, but how activity is carried out by the participants at any given time, and the interrelation between personal engagement and social conduct has not been explored. Vom Lehn's (2002) work was a particularly useful step in that direction, since it offered a detailed explication of how museum objects are constituted through social interaction among visitors. His research, however, became available only recently and it focused only on specific aspects of the visit, as was pointed out in Chapter 2. Furthermore, technological museum applications that connect local and remote audiences have not been evaluated, nor have they been studied with issues of sociality in mind. Additionally, the *Mack Room* mixed reality environment was a novel approach to synchronous distributed museum co–visiting that had not been pursued (or studied) before. However, similar approaches have been studied in the areas of media spaces, collaborative virtual environments and pervasive mobile games, which this chapter draws on.

At the time of the research, due to limited available knowledge regarding the moment–to–moment sociality of museum visits, the methodological challenge was not only to study social conduct in a museum mixed reality environment but also to understand how sociality influences and is influenced by interaction in collocated visits. The initial task was to capture and understand social conduct in the course of collocated shared visits to museums, this being verbal and non–verbal conduct, interactions around and about displays and so forth. This investigation focused on non–educational groups of visitors. As will be shown in the following chapters, this part of the research not only offered a reference point for the overall discussion in this thesis but also complemented and further extended the literature that was made available in the meantime.

The second task was to understand how social conduct was achieved in non-collocated shared museum visits, through the study of data acquired during trial sessions in an experimental mobile mixed reality museum environment. The third task was to bring the acquired knowledge together under an understanding that would offer insights regarding museum co–visiting among non–collocated visitors, and how such insights might fit with the museum environment and feed back to the ongoing study and understanding of the use of mixed reality environments for informal/leisure activities.

This research focuses on "casual visitors" (Falk and Dierking 1992), hence adult only groups that visit the museum in their leisure time, with no pre–defined schedule of visit or as members of a structured educational activity, e.g. a guided tour. The selection of the type of visitors was based on the identified gap in the recent visitor studies literature, which tends to prioritise research in educational groups, such as families and school parties. However, it is expected that the dynamics of the interaction in adult–only groups of casual visitors are different to those of instructor–student interactions that usually define the adult–children groups. The selection also appeared to fit well with the settings under study since the preparatory observations in the two cultural institutions that granted permission for this research indicated that casual adult groups of visitors were the main type of visitors—that was confirmed by members of staff that attributed this

bias to the limited numbers of children–oriented displays in the galleries[14]. A third incentive was the overall orientation of the *City* project towards adult groups of users, as this was inferred in early user scenarios; similar 'target groups' were also explored in related studies of tourists (Brown and Chalmers 2003).

The methodological plan of the research did not involve a unified approach or a rigid framework that would cover all aspects of data capture and analysis. Rather, it opted for an explorative combination of techniques for reasons that become apparent in the rest of the chapter. Furthermore, it did not aspire to extend or indeed create theory. The diversity of the settings and the data available within the time of a doctoral investigation would neither justify nor do justice to this kind of decision. The key goal of the research, the study and understanding of social conduct as it is naturally produced and recognised during the activity of co–visiting, pointed at a qualitative methodology and more particularly an ethnographic approach. The motivation for this is discussed further below. This is also in keeping with current methodological trends in the study of technological applications and mixed reality environments for informal communication and gaming. For example, see (Benford, Flintham et al. 2004; Crabtree 2004a). The analytical orientation was particularly inspired by ethnomethodology; it was also complemented by notions discussed in interaction analysis (IA) and conversation analysis (CA).

4.1 Understanding practice: an argument for ethnography

For the purpose of this research, ethnographic fieldwork was undertaken. Ethnographic fieldwork is a naturalistic approach towards the study of a setting and the activities that take place within it. It particularly focuses on exploration of activities in their natural setting in order to contribute towards an understanding of the world as perceived by those within the world (Harper 2000). Furthermore, it investigates relations among activities as opposed to single tasks or single isolated individuals.

Ethnography was initially practiced by social anthropologists, foremost Bronislaw

[14] At the time of this research, the House for an Art Lover was in the process of developing an educational area, which would increase the exhibitions' desirability for groups with children.

Malinowski, who used fieldwork and ethnography in order to study remote, and often exotic, cultures. Ethnographic fieldwork was a way for Malinowski to "become intimately familiar with the way of life through learning its language and culture and living according to its regime" (Anderson 1997). Since the 1930's, ethnographic work also became popular among social scientists, especially those who comprised and followed the so–called Chicago School that sought to understand the city life. The purpose of sociological ethnography was often to investigate and present the orderliness of behaviours within social groups and communities that were widely perceived as out of the social order of the city, for example beggars, gamblers, and pimps (Button 2000). In recent decades, ethnographic research has been used in work–related settings (for example (Orr 1996)) and leisure settings (for example (Laurier, Whyte et al. 2001)). Ethnographic fieldwork has extensively been used in the study of technology, as will be discussed later in this section.

Ethnographic research has been used before in museums, in particular with regard to activities that are carried out by museum staff. Hemmings et al. (2001; 1997) used ethnography to study the way classification work is done among museum professionals in the Manchester Science Museum. Furthermore, MacDonald (2002) produced an ethnography of the design process of the exhibition *Food for Thought* in the Science Museum in London. As part of her research, she also observed visitors to compare their meaning making processes to the ones intended by the curators of the exhibition. Goffman's frame theory informed the understanding of the latter part of her research. Influenced by the anthropological tradition of ethnography, Stoke-Rees (2003) examined the ways in which the new national museums in Singapore, Hong Kong and Macau attempted to renegotiate the national past in the new postcolonial era in their professional practices.

The study of visitors, however, has been traditionally based on quantitative approaches, or qualitative approaches that may produce, among others, quantifiable results, such as questionnaires, interviews and observations that aimed at measuring visitors' behaviours, such as dwell time in front of exhibits, length of visit and so forth. For example, visitor tracking and observations have been used to identify individual visitors' navigation patterns and develop

exhibition design heuristics (Melton 1935), to contribute to the evaluation of exhibitions (Gilbert and Priest 1996), to inform the redesign of exhibition spaces under the auspices of space syntax (Psarra, Grajewski et al. 2002) and so forth.

In–depth study of co–visiting and its social dimension has been mainly pursued with regard to the cognitive outcome of the visit, as was shown in Chapter 2. Furthermore, research that looked at the ways co–visiting is reflexively and ongoingly organised by the participants and how social conduct might shape the overall activity focused on activity that happens in front of artefacts (Hensel 1987; Hindmarsh 2003; vom Lehn 2002). Consequently, there is very limited information around the activity of co–visiting as it unfolds, not only in front of but also in between artefacts, through the practices companions develop to stay together, start and finish their visit at around the same time, and negotiate their navigation around artefacts, displays and rooms. It is this gap that this research aims to fill. An ethnographic approach, i.e. the *in situ*, naturalistic study of the setting and the people who visit it, may aid the comprehension of the role of social conduct in the shaping of the co–visiting activity overall, as it is negotiated by the participants in the situation.

4.1.1 Ethnographic approach and technological research

Ethnographic fieldwork has been also undertaken in the study of technologies. Workplace studies that were discussed in Chapter 2, extensively used ethnographic fieldwork to let designers "resonate with the circumstances of systems' use" (Crabtree, Nichols et al. 1998). In that field of research, ethnographic fieldwork appeared as a competent alternative to quantitative studies, which tended "not to present things the way they actually occur in real environments" (Hammersley 1992: 11-12; Shapiro 1994). Naturalistic observations were able to avoid—or limit—the assumptions imposed by the researcher on the design of the research techniques as well as the mediation of the reality through the participants' perception. In laboratory studies, this situation was further aggravated by the fact that the studies were usually separated from the place and time of the actual activity.

A variety of methods and analytical orientations were used and developed in the

naturalistic studies of technology in collaborative activities. Under the limitations of short design periods or settings that do not tolerate inadequately trained researchers as active participants, rigorous participant observation over a long period of time was altered to fit a "quick and dirty" approach that focused on "strategic decision making to select those aspects of the work setting of particular importance in informing design" (Hughes, King et al. 1994). Furthermore, Millen (2000) discussed a model of "rapid ethnography" which was based on teams of researchers, and used interactive observation techniques to "increase the likelihood of discovering *exceptional* and useful user behaviour".

It is, however, the ethnomethodological approach to fieldwork that is more prominent in the study of technology. As Shapiro (1994) pointed out, "it has become a shorthand or simplification in CSCW to speak of ethnography when in fact what is often involved is ethnomethodological ethnography". Under the auspices of ethnomethodology and interaction analysis (IA), ethnographic fieldwork was extensively combined with video technology to record detailed verbal and gestural interactions among participants. In this process, fieldwork is used to identify interactional "hot spots" that become the focus of videotaping while both approaches inform each other in the understanding of the context of the activity (Jordan and Henderson 1995). Video recordings formed the basis of the analysis of distributed co–visiting in this research too.

Although the ethnographic tradition has emphasised the study of practices as they naturally occur, within the field of technological design the notion of ethnographic research has been further expanded to cover naturalistic observations of 'quasi experimental' settings under Garfinkel's notion of "breaching experiments". The concept of breaching experiments suggests that the ways "structures of everyday activities are ordinarily and routinely produced and maintained" can be revealed through their disruption (Garfinkel 1967: 37). Consequently the strangeness of a familiar activity, which often gets unnoticed, can be detected. For example, Crabtree et al. (2004a) claimed that their research in mixed reality games "employ[s] ethnography to explicate the sociality of use by treating technological innovation deployed in the wild as 'breaching experiments' that illuminate the interactional practices of organizing use". Similar approaches had been deployed

before in the study of sociality in the organisation of conduct in manipulation of objects in CVEs (Fraser 2000) and media spaces (Heath and Hindmarsh 2000). This present investigation also uses the notion of breaching experiments by often regarding the mixed reality technology in the museum setting and the disruption it introduced to the ordinary activity of group visiting as stimuli for further exploration of the practices of collocated visitors.

As should be apparent from the discussion in this section, this research has adopted an ethnographic approach inasmuch as it investigates the activities under question in naturalistic ways. This thesis does not intend to produce a traditional ethnography of museum co–visiting, collocated or distributed. Rather, it combines naturalistic methods and their variations to facilitate exploration of social conduct that takes place in two distinct situations of museum co–visiting, among collocated visitors and among non–collocated participants in a quasi–experimental museum setting respectively.

The combination of techniques, in many respects, reflects the object of inquiry. As Crabtree (2003: 50) graphically put it: "just about any ethical acceptable array of techniques may be employed to explore the work of the site, insofar as they are appropriate to the study of that work". Similarly, Bowers (1996) advocated the necessity to combine ethnographic fieldwork with more detailed interaction analysis to investigate the way interaction in CVEs shapes and is shaped by interaction in the physical settings of the participants. Additionally, Ruhleder (2000) suggested that research in distributed environments might also accommodate techniques contradictory to the analytical orientation as long as they offer an insight in the user's understanding of the situation, e.g. the combination of interaction analysis with 'thinkalouds'. The following section describes the empirical research that supports this present thesis.

4.2 The studies

Unlike ethnography's tradition of long term studies and its inclination towards *objective* recording and understanding of the orderliness of activities and how they fit with the social structures of the participants' life, this research explored two

variations on the main approach: a relatively short ethnographic study of collocated visitors, and a naturalistic study of an *in situ* deployed experimental environment. Both studies were focused on the activity of co–visiting from the visitors' point of view, particularly the interactional qualities of social conduct. The studies nonetheless produced dense descriptions and outlined the ecology of the visiting setting as well as the practices that constituted the visiting activity within the setting, in fashion similar to ethnographic investigations. Ethnographic techniques such as field notes, semi–structured interviews and video recordings were used. This section presents the practicalities involved in *doing the studies*.

4.2.1 The study of collocated visitors

An ethnographic study was carried out over the academic year 2001-2002 in two cultural institutions in Glasgow, The Lighthouse and the House for an Art Lover, which were described in the previous chapter. The purpose of the study was to look at the activities of group visitors in the two institutions. The methods used in these studies were ethnographic, particularly unobtrusive and participant observations. A small number of sessions were also recorded on video.

The study concentrated on 'casual visitors' in groups or as singletons, rather than the more structured visits of school groups and families. Approximately 60 visitors were observed in non–educational adult groups of two, three, four, five people and few singletons. The particular groups were selected on the basis of their composition and their status as visitors to the exhibition, as opposed to participants in other functions that happened to take place in the exhibition space. Since the study did not aim to observe a representative sample of visitors but instead to develop insight in the interactional aspects of casual visits, no rigid framework was used in the selection of the visitors to be observed. Participants were selected on the basis of the group composition, adult–only groups who were not accompanied by a guide, as they walked into the two institutions. The intensity of the observational method meant that only one group of visitors was observed at a time. However, interactions of other members of the visiting public were also observed and noted when happened in the proximity of, or in relation to the activities of the main group in any given observation.

Field notes of people's activities, movements and interactions were recorded. People's discussions were also recorded whenever overheard. In both institutions, the study was carried out with the institutions' prior agreement and consultation, and with the knowledge and cooperation of the gallery attendants. In the Lighthouse, the researcher was carrying an institutional badge; in the House for an Art Lover that was not required by the museum administration. Publications based on the studies were also made available to the institutions.

The two institutions were chosen because on one hand they shared the same topic, the life and work of C. R. Mackintosh. On the other hand, they explored different ways of organising and presenting the material. As was explained in Chapter 3, the Mack Room is a single gallery exhibition with a number of original objects intermixed with touch screens and digital screen displays that convey a substantial amount of digital information. The House for an Art Lover is a recently constructed house, but built, decorated and furnished according to Mackintosh's designs. It is widely perceived as a historic house attraction, and a visitor is offered an audio guide with information about the House and Mackintosh's work.

In the Lighthouse, I observed visitors as they entered the gallery, and through their visit and in eight cases, manually recorded their movements on a map (for example see Appendix 2). Field notes of visitors' interactions with each other, and with displays and attendants, were also taken, and in some cases photographic evidence was recorded. The discussions of the visitors were recorded whenever overheard. Additionally, informal discussions with the curator of the gallery, the architect and designer of the gallery and the attendants complemented the understanding of the setting. Other sources of information regarding visitor experience were also consulted, for instance copies of the designer's architectural drawings, showing the expected flow of archetypal visitors around the exhibits in the Mack Room, along with notes about their anticipated experiences.

In the House for an Art Lover, I conducted unobtrusive observation of visitors for six days within a period of four months. The times and days included weekdays and weekends, and covered both morning and afternoon times. This was necessary since the operation of the house varied in the different circumstances. Visitors

were observed as they started their visit and, in some cases, their visit to the adjacent museum café and shop was recorded too. Detailed field notes were taken of their activity and discussions were recorded whenever overheard (for example see Appendix 3). In a few cases, I was also involved in occasional discussions with some of the visitors as part of the interactions that usually take place among collocated visitors. On one particular day, the visiting activity in the house was video recorded with a hand–held video camera. Recording with a hand–held video camera was chosen over tripod–mounted cameras to capture an overall sequence of an activity instead of activity around a specific artefact[15]. Informal discussions with the attendants of the gallery and the marketing officer of the attraction were conducted. I was also given access to the results of a marketing survey of visitors conducted by the institution with the method of self–administered questionnaires.

4.2.2 The study of non–collocated visitors

Data regarding the co–visiting activity in the mixed reality environment were collected in two situations: a) during informal pre–trial sessions and demo sessions and b) during organised trial sessions. The former included two informal pre–trial sessions with friends and fellow researchers and a demo–session with employees at The Lighthouse. All sessions took place in The Lighthouse. Field notes of the participants' activity during the pre–trials and photographic evidence of their interactions were recorded. A debriefing informal discussion about both usability–related and experience–related issues followed the pre–trial sessions. Data collected in the pre–trials was not directly considered in the analysis process. It helped, however, with the familiarisation of the system setting.

The main research material regarding the study of non–collocated visitors was collected during user trials. These user trials, however, were designed to cover a range of research inquiries that among others included issues of sociality that this thesis is concerned with. In that respect, the trials were designed to create a pool of data which a range of researchers might consult in different stages of the

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[15] Hensel (1987) also reported the use of hand–held video recordings in a series of her investigations of museum visitors. She, however, pointed out that hand–held recordings appear to produce home–movie like quality and therefore they might be unsuitable for scientific investigation. This did not appear to be the case in the present investigation, since field notes also supported the video recordings.

overall project. The design and execution of the trials were also a result of collaborative effort that involved myself and other members of the project team, who had input with regard to the structure of the trial as well as the day–to–day running of the overall sessions. The user trials of the mixed reality environment took place in the Lighthouse in summer 2002. The participants were recruited as friends and museum–goers through poster advertisements in both the university campus and the centre of Glasgow. The motivation behind the advertisement was to recruit groups of people who were already familiar with each other's interests and taste, in a fashion similar to groups of casual museum visitors. A small reward (£10 per person) as well as the estimate duration of the visit (1 hour) was also mentioned in the poster advertisement.

Ten groups of three and two groups of two members participated. Each group was invited to visit the Lighthouse. The routine of the overall trial session involved three well–defined stages: In the first stage the whole group was welcomed in a separate office space in the Lighthouse and was briefed about the trial session; initially they were asked brief background questions regarding their previous museum experiences (e.g. whether they like visiting museums and when they had last visited a museum). Subsequently the outline of the session was explained to them as well their rights as participants to the trial. In this process, the participants were asked to award consent regarding the use of the collected material (both recorded video and audio of the trials) for academic purposes. All participants were happy to consent with the use of all data.

In the following stage of the trial session the participants were introduced to the specific technologies. The usual order of introducing technologies to people started with the setting up of the VE participant, followed by the setting up of the hypermedia participant and lastly the on–site participant. This order allowed further familiarization time for the remote participants and particularly the users of the 3D environment. The allocation of people to media was based on *impromptu* agreement among the members of the group. This arrangement was felt to facilitate a feeling of comfort and agreeability among participants.

The participants' knowledge of C. R. Mackintosh varied considerably, from

experienced visitors who had visited the majority of the Mackintosh related attractions in the city to complete novice viewers. Their technological experience also varied. However, all participants had used a computer before and they were familiar with web browsing.

Each visiting session lasted approximately one hour and was comprised of an explorative part and an activity–based part. In the first part, the members of each group, after they had been introduced to their respective technologies, were encouraged to familiarise themselves with the technology. Participants were not explicitly asked to collaborate or communicate with each other. However, casual suggestions as to how they might go about familiarising with the mixed reality environment, such as by locating each other in the room, and spotting the same display were mentioned to them. Additionally, participants were prompted to explore the overall mixed reality environment according to their own interests. Again, casual suggestions such as to wander around their environment to familiarise with the information delivery (both through the digital and analogue media) were proposed to them. In the second part, they were given a mixture of open–ended and focused questions (a separate set of three questions for each of the participants) about Mackintosh's work, and were asked to come up with answers based on evidence from the gallery or their personal experience of the exhibition. No further instructions were provided. The activity of the local participant was video recorded with a hand–held camera operated by myself; the discussions of the whole group were also recorded. The participants' movements on the map or in the 3D environment were logged.

When all participants had finished with the question–based part of the visit they were thanked and they were invited to gather in the office space that they had met at the beginning of the session. Semi–structured debriefing interviews with the participants followed each visit and they were attended by all participants and project team members that were involved in each session. The debriefing sessions aimed to enrich the already collected data with the opinions and impressions of the participants. The participants' opinions about the overall experience as well as issues around the use of specific features of the system were discussed. Participants were also asked to relate their experience with other museum

experiences they had, them being either on–site or on–line. Furthermore, they were invited to ask questions and make suggestions. (Examples of the debriefing interviews are included in Appendix 4).

Although the overall mixed reality setting was experimental in its structure, the sessions ran in regular opening times of the gallery and with no particular space arrangements to accommodate the event. In that respect, the participant in the gallery was constantly confronted with the local organisation of the environment and the ordinary visiting activity of the setting. A paper announcement in the entrance of the gallery notified the visitors about the experiment taking place and a researcher was available during the trial session to reply to any enquiries. However, neither the researcher nor the gallery attendants received any related enquiries or comments during the sessions.

4.3 Analytical orientation

The observational studies, the video recordings and the interviews resulted in a corpus of diverse material that offered insights into micro–interactions as well as macro–interactions among visitors in the galleries. Micro–interactions are localised events/exchanges among visitors in front of specific displays or in a given moment during the visit. Macro–interactions are styles of activity that occurred throughout the course of one visit, or activity that was developed more gradually throughout the duration of the visit. The goal of the research therefore was "to discover the correct manner of interpreting whatever data" was selected during the fieldwork (Hammersley and Atkinson 2000).

A preliminary investigation of the data from the fieldwork pointed out that co–visiting among non–educational groups of friends involves constant negotiation of one's personal engagement with the exhibition and with one's social interaction with one's companions. Based on this notion of negotiation, further examination of the data of collocated visitors resulted in the sketching out of three styles of co–visiting activity (Galani and Chalmers 2002). In the first style, co–visitors are tightly connected: they stay together during their visit, and interact with the same display at the same time. In the second style, co–visitors are loosely connected:

they interact with different displays but they often stay relatively close to each other or within visual range of each other. For example, visitors who use audio guides usually experience this style of co–visiting activity. This type of interaction also appeared to involve increased gestural conduct among co–visitors. In the third style, co–visitors are independent navigators: they follow their own individual routes for the main part of the visit and meet up with companions only occasionally; the meetings among co–visitors could be either accidental or deliberate. Despite the individualistic exploration of the exhibition, companions who favoured this style made sure that they would exit the exhibition together.

This initial exploration confirmed and expanded findings reported in previous research by McManus (1987) and Draper (1984). McManus, in her observations of groups of visitors around selected exhibits in the London Science Museum, identified, on the basis of proximity in between members of a group, that there are three categories of group cohesion: poor, good and very good with the second being the most popular (62.2%) among the studied visitors (McManus 1987: 127). Respectively, Draper's interviews with return visitors in the Exploratorium indicated that there were "two ways of progressing" through the exhibitions with others: by remaining together throughout the entire visit or by separating almost immediately upon entering the museum and remaining apart for the majority of the visit (Draper 1984: 211-212).

Those approaches to group museum visits, as well as findings of the observations of collocated visitors of this present research, indicate that co–visiting is a complex dynamic activity. However, a classification scheme that organises co–visitors into categories according to their behaviour, as useful as it might be proved for potential design of applications, is simplistic when it comes to contributing towards the understanding of how social conduct shapes and becomes shaped by the co–visiting activity. Furthermore, criteria used to classify co–visitors in categories, such as proximity to each other, become radically altered with the introduction of mixed reality technology. Therefore it would be methodologically inconsistent to pursue this approach as an analytical device applied to the aggregate of fieldwork data of this research.

Since the purpose of this present investigation was the exploration and study of existing practice among collocated visitors and of non–existing practice among distributed visitors in a mixed reality museum environment, an approach based in ethnomethodology (Garfinkel 1967) was chosen. Ethnomethodological investigations are concerned with the study and understanding of naturally organised ordinary activities and especially the "methodologies" people use to make sense, find their way about and act on the circumstances in which they find themselves. As Livingston (1987) pointed out, this concern puts emphasis on the study of activities that are ordinary, and naturally organised "in the sense that [their organisation] is part and parcel of the activity itself, making that activity what it is". This stance of ethnomethodology indicates that all activities are inherently social and dynamic in the fact that "participants reflexively, and ongoingly, constitute the sense or intelligibility of the 'scene' from within the activities in which they are engaged" (Heath and Luff 2000). This approach has been of particular influence in the study of technology in various settings, as was discussed in Chapter 2.

Ethnomethodology suggests that activities cannot happen or be analysed independently of the context in which they are generated and maintained (Heritage 1984), i.e. all activities are context–dependent and situated. This approach appears in keeping with the appreciation of the museum visiting experience as the product of interrelation among physical, personal and social context (Falk and Dierking 1992), as it was discussed in Chapter 2. However, ethnomethodological inquiry is not interested in identifying the context of an activity but in studying the ways in which this context is orderly and reflexively accomplished in and through practical actions and practical sociological reasoning of the participants in the setting.

A central aspect of the reflexive constitution of a situation is the notion of accountability. Although accountability in organisations is often associated with liability with regard to organisational rules, and in social circumstances with etiquette, in ethnomethodology accountability is based on "the detailed, collaborative ways in which members manage their conduct and their circumstances to achieve the observably orderly features of their activity"

(Zimmerman and Boden 1991: 7). The underlying implication is that actors design their actions so that their sense is clear right away or at least explicable on demand (Have 2002).

The notion of accountability is particularly relevant in the present investigation, not only in the explication of the ways collocated visitors organise their visit as a 'co–visit', but also in the understanding of how the introduction of technology may change the perceived accountability of actions in context. This stems from the fact that accountability and context are interdependent in their accomplishment, and the introduction of technology inevitably changes the context of an activity. The topic of accountability is discussed in two instances in this thesis: Chapter 6 examines co–visitors' accountability in the management of collaborative pace and Chapter 7 explores issues of handling conflicting accountabilities in the mixed reality museum environment.

Furthermore, the analysis of the data took advantage of two other complementary approaches in sociology: Conversation Analysis (Sacks 1998) and Interaction Analysis (Jordan and Henderson 1995). Conversation analysis was inspired by and developed in parallel with ethnomethodology and it took particular interest in the use of language in the organisation of conversations. Main features in CA investigation are turn taking and the sequentiality of talk. The study of sequentiality points at the indexicality of talk and action in the fact that, any utterance or action becomes understood only with reference to what has preceded it and the same time shapes the context in which the next action will be perceived. In that respect, the understanding of the ways an activity is achieved from the actors' perspective is bound to the study of the sequential character of action. CA has been implemented before in museums for the study of audio guides. Woodruff et al. (2001), on the basis of conversation analysis, indicated the conversational role of electronic guidebooks in the course of a group visit and used these results in the design and evaluation of the Sotto Voce electronic guide book.

Furthermore, emphasis on the exploration of the "ways in which participants utilize the resources of the complex social and material world of actors and objects within which they operate" (Jordan and Henderson 1995: 41) along with

the emphasis on the details of human activity, both verbal and non–verbal, rendered interaction analysis (IA) relevant to the analysis of the data. IA was particularly helpful in the exploration of the video recordings of this research, since it turned the attention of the investigation towards aspects of interaction usually overlooked by museologically–informed studies, for example the use of 'gestural pauses' among museum visitors. Furthermore, the use of local resources in the accomplishment of co–visiting is discussed in many instances of the presentation and discussion of the fieldwork in this thesis.

The following section presents some of the issues involved in approaching diverse data from an ethnomethodological point of view.

4.4 Working with diverse data (practically accomplishing analysis)

When we start out with a piece of data,
the question of what we are going to end up with,
what kind of findings it will give should not be a consideration.
We sit down with a piece of data, make a bunch of observations,
and see where they will go.
(Sacks 1984: 27)

While the analysis of data from collocated visits was based directly on field notes and material collected during the field work, specific visualisation tools were developed for the presentation of data from the mixed reality trial sessions. A video tool that permitted the combined and synchronised access to the video recordings from the gallery, the map view on the handheld (the map view in the hypermedia environment is identical except from the shape of icons), and the conversations of all three participants, was made available by the project design team. The analysis of the data was extensively based on the merged movies that resulted from that procedure (for an example see Appendix 5). The primary resources however, e.g. the camera audio recordings as opposed to the recorded audio files on the server, were often consulted for reasons of quality and accuracy. Separate movies that presented the location tracking information on the floor plan of the gallery were also produced.

Furthermore, there was no provision for the recording of the avatar activity in the 3D environment of the gallery in a form that could be later consulted and studied. For presentation purposes, a separate tool[16] was deployed in a separate platform that permitted the capture of images from within the 3D environment. Those images were considered necessary for the reader of this thesis to better grasp the interactions under investigation. Nevertheless, the lack of initial provision for such presentation devices highlights the emerging problem in CSCW of recording and effectively presenting ethnographic data from distributed physical and digital environments.

The analysis of the data did not follow any preformed classification, nor did it focus on popular actions only. In the interactive environment of a museum setting, such an approach would compromise the understanding of the setting's richness. For purposes of analysis, as well as presentation of data, "coherent and concrete cases or *instances*" (Crabtree, Nichols et al. 1998) of the activity were assembled from the field notes and video recordings. The selection of instances was flexible and generous at first, in that variations of the same social interaction, e.g. the shared exploration of an artefact, were taken out of the field notes and video recordings and were explored in detail. However, this is not a straightforward procedure when one is faced with video recordings of continuous activity. It was therefore important to isolate the interactional events to be studied from the overall behavioural flow. As Kendon (1990) suggests, this process soon proves that "there is no "absolute" unit of behavioural organisation", but interactional events can be identified through the exploration of patterns of organisation at the most inclusive levels first. This process is also evident in the presentation of data in the form of vignettes that include information regarding the 'before' and 'after' of the action in question.

In the process of analysis, instances from the initial, exploratory part of the trial sessions were prioritised. That was in keeping with the aims of the research, i.e. the exploration of social conduct in casual group visits as opposed to task–orientated visits. This did not however exclude the study and also the discussion

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[16] I am grateful to Holger Schnädelbach, doctorate researcher in the Mixed Reality Lab at the University of Nottingham for making available this tool.

of incidents from the activity–based part, when those appeared of relevance and significance for a specific topic. Those incidents are clearly indicated when included in the following chapters. The selected instances were not treated in isolation from the initial recordings. I often went back to the collected data to expand or further segment the selected instances into meaningful excerpts. This process informed the overall appreciation of social conduct as it was produced and recognised by participants in the situation at hand.

For the presentation of instances in this thesis, more practical criteria were also applied, for example the clarity and quality of the images and the sound and the overall 'presentability' of the excerpts in a textual format. Since the interactional qualities of dialogue were not the focal point of this thesis, conversations were transcribed in simple format which included the description of actions alongside the conversations, as opposed to the elaborate transcript used in conversation analysis. However, a few indications of the interactional qualities were kept, namely the pause and the overlapping talk. The pause is measured in seconds and is indicated by a number in brackets; the overlapping talk is indicated by square brackets that precede the letter that the overlap starts at. This choice of transcript aimed at improving the intelligibility of the video excerpts (Crabtree 2003) but also seemed to be more appropriate for the combined presentation of excerpts that may not be supported by audio recordings with ones that do.

Overall, the discussion of data in the thesis prioritised the exploration of the co–visiting activity over the study of the individuals' interactions with the technology *per se*. In saying that, I do not claim that experience in a technologically mediated environment may be separated from the features of the specific technology that affords it. The main purpose, however, of this thesis is not to discuss the use of the technology, or indeed to evaluate the results of the technical design decisions. Therefore, in the presentation of data, the practices surrounding the shared visiting experience and how they were accomplished are prioritised. For example, in Chapter 5, the section that discusses the mixed reality participants' orientation towards shared artefacts focuses on the ways the participants achieve common orientation and the effect this has on the activity, instead of their difficulty to negotiate for instance 'right' and 'left' inside the mixed reality environment. The

latter and other similar issues have been nevertheless discussed elsewhere (Brown, MacColl et al. 2003).

The presentation of data follows three themes that arose in the exploration of data. Those themes concern social conduct of co–visitors in the exploration of artefacts and interpretive material, the organisational practice of the visit, e.g. how co–visitors coordinate their pace, and the ways co–visitors make sense of their environment and its norms in connection to their friends. Those themes are sequentially discussed in the three chapters that follow.

4.5 Conclusion

This chapter looked at the methodological aspects of this research. It presented the methodological challenges of capturing, analysing and studying social conduct in diverse museum settings, some traditional and some mediated by mixed reality technology. An argument for naturalistic study was put forward and the advantages of the approach were discussed with reference to similar technological research in the field of CSCW and existing naturalistic research in the field of visitor studies. The analytical orientation of this research on the basis of ethnomethodology was presented. Complementary issues, borrowed from CA and IA, were also explained. The practicalities of *doing* the studies were presented in detail. The following chapter discusses the analysis of the research concerning social conduct of co–visitors around the exploration of artefacts.

5 | Collaboration around displays

The exploration of displays and the engagement with artefacts and the available interpretive material is the focal point of a museum visit. As discussed in Chapter 2, the majority of research in the field of visitor studies is preoccupied with studying and untangling the relationship between the visitor and the museum artefact. Furthermore, the majority of technological innovation in museums also focuses on ways to support one's engagement with the exhibition. One's exploration of artefacts may be triggered by personal interests, motivation and agendas. However, in group visits one's exploration of artefacts is also influenced by one's social interaction with one's companions (Dierking 1998), and vice versa. This chapter looks at social conduct during the exploration of museum displays among collocated and non–collocated visitors, with a focus on the latter.

The ways people explore displays with companions has been discussed in museum studies literature with reference to a variety of methodological and theoretical orientations, as was shown in Chapter 2. A range of visitor studies that looked at the interactional aspects of social conduct in museum visits examined, among others, the relation between group cohesion and well–recognised museum behaviours (McManus 1987), the constitution of museum artefacts in and through social conduct (vom Lehn 2002), the organisation of conversations around displays (Hensel 1987; Leinhardt, Knutson et al. 2003) and so forth. The issues explored in these studies have a bearing on the organisation of this chapter and the discussion it contains.

It is not the aim of this chapter to exhaustively analyse every aspect and consequence of social interaction around museum artefacts. Rather, it focuses on the discussion of vignettes, from collocated and distributed visiting activities, that facilitate the explication of specific aspects of social activity around displays. The presupposition of this chapter is that, in group visits, one's engagement with the content of exhibits is a dynamic event that is socially organised and mediated as one becomes involved in direct exploration of artefacts in the presence of companions, displays personal engagement and becomes aware of one's companions' personal engagement. The use of verbal communication as a key

resource for the reflexive constitution of the intelligibility of the activity among distributed participants is also discussed.

Since the topic of social exploration of artefacts among collocated visitors has been discussed before in detail in visitor studies (vom Lehn 2002; vom Lehn, Heath et al. 2001), this chapter prioritises the discussion of data from the trial sessions with the distributed participants. It presents, however, selected vignettes from the fieldwork of collocated visits to initiate the discussion of the several issues concerned, and create points of reference and departure for the overall exploration. It combines those vignettes with findings from existing visitor studies research. In that respect, the chapter confirms findings from other studies with respect to social conduct during museum artefact exploration, and points out aspects of artefact exploration that are particularly significant among non–collocated visitors, for example the achievement of common alignment towards an object.

The vignettes presented in this chapter, as well as the following chapters, take various formats according to their primary source, e.g. field notes, dialogue transcripts with video images, quotes from interviews etc. Whenever available, images accompany description; however, the majority of excerpts from the study of collocated visitors are text–only field notes. The majority of the excerpts from the mixed reality environment are supported by a range of images that show the view from inside the gallery, i.e. the local visitor, the display on the map and the view from inside the virtual environment.

5.1 Social engagement with exhibits

Visitors' exploration of and engagement with displays, labels and so forth has been at the heart of visitor studies for several years. Baxandall (1987) noted that the bulk of art museum experience is not about "looking at pictures but about talking about looking at pictures", and the labels are a means of constructing the visitors' dialogue about art. The time people spend in front of displays, looking at artefacts and reading labels as well as the way they use the label content in their conversations have been explored in many studies, for example (McManus 1989),

and have been used as criteria for understanding and evaluating both museum text and visits. More recently, visitors' classifications with regard to individual engagement with exhibition content and navigation of the exhibition space (e.g. (Levasseur and Véron 1983; Serrell 1996)) have informed the design of digital systems for personalised museum and city visits (Hatala, Kalantari et al. 2004; Kruppa, Krüger et al. 2003; Marti 2001; Sparacino 2002).

However, the majority of these studies and systems focused on the individual visitor and overlooked the role of social conduct in the access and appreciation of artefacts and their content. According to visitor studies, social interaction influences the reading and conversation behaviour of co–visitors as well as the time they spend in front of exhibits (Hensel 1987; McManus 1987). Furthermore, co–visitors' engagement with exhibits is not limited to conversations about and around displays but also involves non–verbal behaviour, such as pointing, animating gestures, posture, etc. that often reveal aspects of the exhibit to one's companions, cause surprise, attract attention and so forth (vom Lehn 2002). In traditional museum visits, and also other activities that involve the use of objects (Hindmarsh and Heath 2000), these aspects of sociality take advantage of a series of resources available in face–to–face interaction among collocated participants such as posture, orientation, gesture, gaze, verbal communication and so forth.

The synchronous exploration of and engagement with artefacts that may be available to distributed participants in diverse representations is not discussed in detail in the literature. Within the field of CVEs, Barbieri et al. (2000) briefly reported that discussions around artefacts in the Virtual Leonardo application were limited; neither were there any reported accounts of visitors in that environment using the operable Leonardo's machines. Furthermore, Hindmarsh et al. (1998) in their study of distributed and collaborative furniture arrangement inside CVEs reported that interaction among participants was problematic and often inhibited the main activity. However, in CVEs distributed participants engage with the same kind of artefact representation at any time. Those studies, as well as research in the social constitution of objects in media spaces (Heath and Hindmarsh 2000), inform this chapter. Consequently, the discussion in this chapter expands the research in this field to cover issues regarding artefact

appreciation by distributed participants.

This section overall is concerned with co–visitors' engagement with museum displays, i.e. co–visitors' appreciation of and mutual contributions towards making sense of exhibits. The discussion particularly focuses on the ways an artefact and information about it are accessed, revealed and generated through social conduct among co–visitors, and how asymmetries in mixed reality environments may hinder or enrich this process. For that purpose, it draws on examples from both studies of collocated and non–collocated visits. The former has the role of initiating the discussion and offering points of departure for the exploration of the latter. Although the disposition of this thesis is to prioritise material of the explorative part of the distributed visiting trial sessions, an excerpt from the question–based part is also included in this section (vignette 5.3). This was considered desirable because the specific excerpt highlights in a clear manner aspects of collaborative artefact exploration that were consistently observed throughout the trial sessions.

5.1.1 Artefact appreciation among collocated visitors

Collocated visitors in the House for an Art Lover and the Mack Room extensively interacted with each other and the artefacts, and contributed to the shared exploration of a display by volunteering information about the display and highlighting interesting details, often by physically (and also verbally) pointing at them. They also discussed the content of labels, and they read aloud or paraphrased label text for their friends (McManus 1989). In this respect, different members of a group were able to satisfy their own interests and, at the same time, share those interests with the group. Collaborative exploration did not only happen with displays but with the overall exhibition space too—this being more obvious in the exploration of historic houses, where displays often coincide with architectural or decorative features of the exhibition space.

The field studies suggested that collaborative exploration of artefacts was facilitated by a series of information resources that were available in the gallery, which were made relevant to the activity in and through social conduct among companions. A vignette from the House for an Art Lover offers an appreciation of

what collaborative engagement with artefacts might involve. There is no intention to use this vignette as a representative example of social conduct around museum displays. It should rather be treated as a convenient entry point to the topic.

Vignette 5.1

A group of two women (W1 and W2) visited the House for An Art Lover. Since the visit happened on a weekday, they entered the exhibition space from the interpretation area, where they watched the video projection about the making of the House. We join the action later in their visit, when they entered the *Dining Room*. The main point of interest is the interaction around the gesso panels.

> *Then W1 and W2 walked through the foyer to the dining room. They looked at the index and they both keyed the number of the introduction on the audio guide. They both walked along the left side of the table listening to the audio commentary, and pointing out and talking about the stencils and then the gesso panels. At that moment they both stopped the audio guides and W2 pointed at the gesso panels on the right side of the sideboard and said that those were the panels that were shown in the video [introductory video in the interpretation area]. –W2: …and it tells a story [this is the exact phrase on the video]. W2 took a step back and she looked at the whole series of gesso panels on the left wall. –W2: ah, yes [as to agree with the video or like she had just discovered what the video meant]. W1 tried to remember the ingredients of gesso [as they were described in the video]. She recalled the rabbit glue, commenting that it was disgusting. W2 said (in a joking tone) that she could order some of them [meaning the gesso panels] for her dining room. They both circulated the table and moved towards the door of the dining room and they looked outside the last window on their left [the view from this window is of trees and the Science Centre tower] commenting that such a house would never have been built in Ibrox.*

In vignette 5.1, the two visitors used their audio guides to listen to the introductory commentary in the *Dining Room* that explained the stencils on the far wall, the ceiling shape and the gesso panels. While they were attending to their audio guides and looking around, they walked on the same side of the room and in

relatively close proximity. As they were close together and they were aware that they were listening to the same audio commentary, they pointed at features of the environment without interrupting their attendance to the commentaries. However, when they started discussing further about the gesso panels they stopped the audio guides. In other cases, however, visitors were observed to keep the audio guide close to their ear while they were conversing with their friends. During their conversation, they stopped in front of the particular display and they examined it from different angles. In their conversation, they both volunteered information about the gesso panels and expressed their appreciation for the artefacts as well as their personal taste, by suggesting, for example, that similar gesso panels would be nice to ornament W2's dining room.

The visitors' engagement with the display, the series of gesso panels, was socially organised in and through their interaction that included pointing gestures, body posture and verbal communication. As vom Lehn (2002) firmly pointed out, the museum artefact—and companions' interpretation of—was ongoingly constituted through social conduct. Information resources in the broader environment, such as the audio commentaries, the introductory video and so forth, were made relevant to the activity of artefact appreciation through conversation. The two participants appeared to explore the content of gesso panels at different levels, that included the features of a specific display, the meaning of the iconography (W1 pointed out that the panels "tell a story"), the material it was made of, and the wider context of the display, for example the location of the building. Some of this information was available in the local environment but part of it was also related to the companions' knowledge of each other—for example W1 did not appear surprised by W2's suggestion to order gesso panels for her own house—but also the wider knowledge of the area. For example, their shared appreciation of the area in which the House is located, as deprived and often associated with football related violence, was brought into their discussion as an additional way of expressing their appreciation for the quality and the beauty of the room.

Furthermore, their appreciation of the gesso panels was particularly supported by their body movements and orientation. As was mentioned already, the proximity of the participants to each other facilitated their progression from focused personal

engagement with the audio guide to focused social engagement with companions and with artefacts. Furthermore, pointing, body orientation and movement supported and sustained common alignment towards the display. Their engagement was further sustained through their collaborative contribution to the discussion—for instance, Hensel (1987) suggested that the exploration of a display ends when nobody in the group has anything more to say about it. It is also worth noticing that the availability of the participants for social interaction is not strictly defined by their engagement with the audio guide, which often gets criticised for inhibiting social interaction (Martin 2000; Walter 1996). Rather the use of the audio guide, the position of the companions and their overall conduct are resources that co–visitors take into account to recognise and to produce the activity in hand. In that respect, collaborative engagement with artefacts is both opportunistic and socially constituted.

It is important here to highlight the situated character of the overall activity of collaborative viewing and engagement with museum artefacts. This is not only due to what cognitive scientists and museum learning researchers often refer to as the highly personal way of meaning making in museums, which is based on one's needs, plans, experiences, knowledge and so forth and therefore is unique. In group visits, the situatedness of the activity is based on the fact that during the collaborative viewing "attention is exhibited to "where–we–know–we–are", to "who–we–know–we–are", to "what–we–are–doing–at–this–point–in–the–conversation [activity]" (Schegloff 1972: 115). For instance in vignette 5.1, W2 initiated a discussion about the gesso panels when both companions were in front of the actual display, their exchange of comments was based on the fact that they had both attended the introductory video and they were already acquainted with each other. Only in that specific context, comments about the ingredients of the gesso material and one of the participants' house decoration may appear relevant and significant. During the collaborative viewing and engagement with artefacts, co–visitors reveal features of the artefact and introduce topics of discussion and appreciation from a wealth of content that is available throughout the museum environment and beyond. In this process, one's appreciation of exhibit content is reiterated during the course of a visit as one accesses more content and is exposed in one's friends' appreciation and appropriation of it. This content may come from

different resources, e.g. a video projection, an audio commentary, personal inspection, personal knowledge of the area and so forth. Whatever the resource, its use and appropriation becomes relevant to the activity through social conduct.

5.1.2 Distributed collaborative appreciation of displays in the Mack Room

The last section offered a brief introduction to the dynamically evolving exploration of artefacts by museum companions as they take advantage of information resources and the qualities of face–to–face interaction. The discussion suggested that access to companions' conduct in terms of one's body orientation, gesture and overall engagement, and shared access to elements of the environment facilitate the shared alignment towards displays and inform the process of collaborative viewing, exploration and discovery. Engagement with an artefact is further maintained through the mutual contribution by co–visitors in terms of conversational topics and personal perspectives on the artefact's features.

Unlike collocated visits where co–visitors potentially have access to the same content regarding the displays—at least the information generated and offered by the museum team—non–collocated visitors in the mixed reality museum environment had access to asymmetric sources of content about the displays. The asymmetry of content applied to both quantity and presentation. For example, the information available on touch screens in the Mack Room was not available online; the same applied on some images too. Furthermore, videos were represented to the remote participants by a static image, and information that was 'hidden' in drawers under display cases was presented in the form of ordinary links to the remote users along with the rest of the content of displays[17]. Some of these asymmetries were attributed to the prototype state of the system, e.g. missing images; others are associated with the transformation of a three dimensional space into a 'low tech' hypermedia web resource. Furthermore, participants had a mixture of symmetric and asymmetric access to social cues. For example, everybody could speak and listen to anybody else but only the local and the hypermedia participants had access to an overview of the participants' location

[17] The asymmetries with regard the content increase further when access to external, other than the museum's own, web resources is also included. In the case of the *Mack Room mixed reality environment*, a 'Google search' was provided to the remote participants but its use was very limited in the course of the trial sessions.

and so forth.

The topic of asymmetries in technology mediated communication and their role in the accomplishment of activities appears relevant in several aspects of CSCW research, such as video mediated communication (Heath and Luff 1992a), collaborative wearable interfaces (Billinghurst, Bee et al. 1999) and mobile collaborative activities (Büscher, Kramp et al. 2003). Those studies looked at asymmetries in the available resources for a task completion and also the detrimental effect of limited social cues in focused communication. An extensive discussion of asymmetries is not within the scope of this chapter. However, collaborative exploration of artefacts among distributed co–visitors meant that participants needed to ongoingly negotiate the asymmetries involved in communication mediated by a range of diverse media. This section discusses asymmetries as they arise within the context of the activity in hand.

It would be premature to generally associate asymmetries in the mixed reality museum environment with unsuccessful or problematic collaboration, as has often been inferred in studies of social conduct in media spaces and CVEs. Problems with various aspects of coordination among distributed participants were nevertheless observed in the trial sessions, especially with regard to their shared alignment to artefacts. However, in many instances of the leisure activity of co–visiting, asymmetries in the presentation of content became a useful resource for further exploration and engagement with features of displays that otherwise would have gone unnoticed. Furthermore, museum visiting behaviours like the ones discussed in the previous section, such as mutual contributions of information in the discussion among co–visitors, were also prevalent in participants' interactions. The following vignettes will help us ground this discussion:

In the following vignettes Green (G) is the on–site participant, Red (R) is the hypermedia participant and Blue (B) is the VE participant. Square brackets ([) indicate overlapping talk; *italics* indicate text borrowed from the museum labels; numbers in brackets indicate pauses measured in seconds (a single full stop in brackets indicates pause less than 1"); a star (*) indicates the position of images in the overall action.

Vignette 5.2

Green (local visitor), Red (hypermedia visitor) and Blue (VE visitor) were friends

and flatmates. Green was in the gallery wandering around the timeline and checking his position on the handheld. Blue was in the virtual environment and she was walking inside the partition wall and talking to Red about the sensation. Red was jumping from place to place talking to Blue. We join the action when Green stopped in the *Willow Tea Rooms* display and checked his handheld. The following scene lasted approximately 1 minute and 30 seconds. It is interesting to follow the subsequent iterations in the artefact exploration between Green and Red.

G: (He stands in front of a display case with memorabilia from The Willow Tea Rooms and he checks his handheld.) Rudy (Red) are you looking at a thing with knives and forks and stuff? *5.2.1

5.2.1

R: Knives and forks and stuff?

B: Knives and forks?

G: Forks and spoons (He moves towards the glass case still checking his handheld.)

B: Who (.) me?

G: No Rudy (Red)

B: Oh where is he? (She was in the *Reception* area and she turned towards the centre of the room.)

R: I'm

G: Ehm the same place as me but (.) on the computer (He stands in front of the glass case still looking at his handheld.)

R: No I am looking

B: Hmmm (She started moving towards the internal side of the *Timeline* wall)

R: I am looking at other stuff at a black kind of seat thing

5.2.2

5.2.3

G: (He raises his head and looks at the opposite wall) (.) Alright [on the wall? *5.2.2

B: [Ah here you are *5.2.3

R: Yeah

G: Right (He moves around the glass case towards the wall which he looks at) *5.2.4

5.2.4

B: (She approached the *Willow Tea Room* zone) (.) So is knives and forks in that in that thing (laughing)?

G: (He turns and looks at the glass case.) *5.2.5

5.2.5

R: Apparently so

G: Yeah (He keeps moving towards the wall with the image of the chair.)

R: Ohh that, that thing

G: (He turns and looks at the glass case.) *5.2.6 Yeah, that thing

B: And a clock?

5.2.6

G: (He stops and looks around)

R: Eh?

G: A cup?

R: A cup? Oh yeah I can see the cup

G: Yeah ok (He starts approaching the glass case.)

R: (Inaudible)?

G: Yeah there is a china cup there

R: [(He laughs.)

B: [(She laughs.)

G: (He leans over the glass case and reads the label.)

5.2.7

It's actually *a willow pattern teacup and saucer* *5.2.7

R: Oh yeah

G: *Used in Miss Cranston's tearooms* (He moves a step back checking the glass case and the handheld.)

B: Ohh I can't see it

G: Ok

R: That's cause you've lent it (.) it says *lent by David David Mullane* apparently

5.2.8

G: (He browses the contents of the glass case.) (2) Lent by who? *5.2.8

R: Lent by David Mullane

G: (He stands back listening to Red) David Mullan?

R: Mullane (0.5) hmmm I don't know

G: (He moves towards the other side of the glass case checking briefly his hand held and the content of the case.) He may be my uncle *5.2.9

5.2.9

R: [Alright you never know

G: [(He walks away from the glass case, he then turns and walks backwards towards the glass case) He was rich *5.2.10

5.2.10

R: That's right

B: (She laughs)

After this interaction, Green (the local participant) walked away from the display

case and announced to his friends that he would wander in the gallery.

Vignette 5.3

The three participants were exploring the *Timeline* display to find their favourite painting which was asked for in the question–based part of the trial session. The excerpt starts the moment Blue (VE) and Green (local) locate the same image on the display. It is interesting to follow the evolution of the exploration with the constant contribution of comments and personal discoveries by the participants. The overall interaction presented in the excerpt lasted approximately 3 minutes and 20 seconds.

B: Oh, I have the Petunias now, I have the petunias as well

G: Petunia ok (She looks at her right at the *Timeline* *5.3.1) ok, petunia? (She looks to her left and she quickly approaches the *Timeline* wall) Ah ok yes I have the petunia. (She touches the time line). Wait *5.3.2

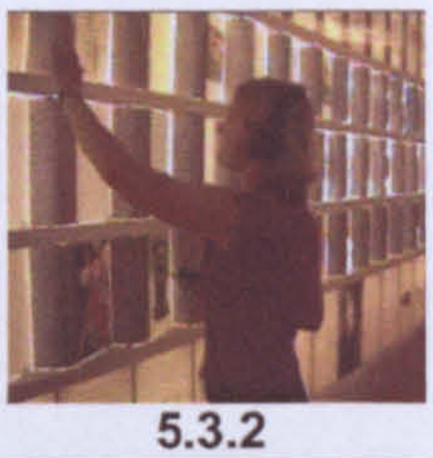
5.3.1

R: [(Inaudible) the image

B: [Can you see it?

G: I can see Petunia but (She takes a step back in front of the Petunias image)

B: It's like three flowers, it's really beautiful, beautiful colours



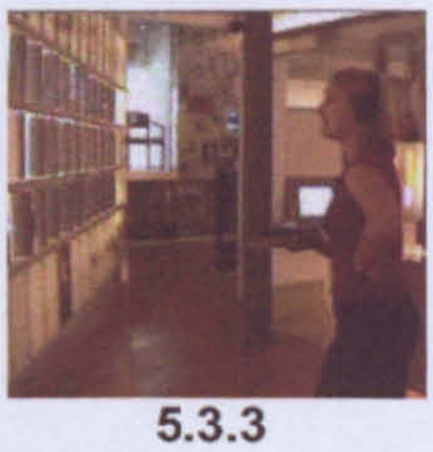
5.3.2

G: Yes, yes (shaking her head) *5.3.3

B: That's beautiful in what they call it and (4) and this is when they were in Suffolk, Mike (Red) if you can help

R: Ahhh

B: And it was in *Nineteen fourteen*



5.3.3

R: [(.) Yeah, yeah

G: [Yeah, F*irst World War* (She stands in front of the Petunias.)

B: (.) Yeah (.) so the question is which one is our favourite

G: Yeah (She laughs.)

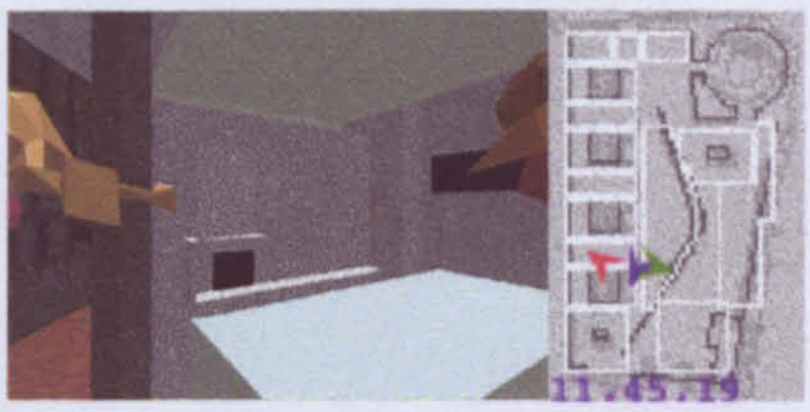
B: I also have a *Rosemary* now

G: [Yeah *Rosemary* in *Nineteen fifteen*

B: [It's really nice I like it

G: Ok, ok I am glad we are in [the same point

R: [Rosemary?



5.3.4

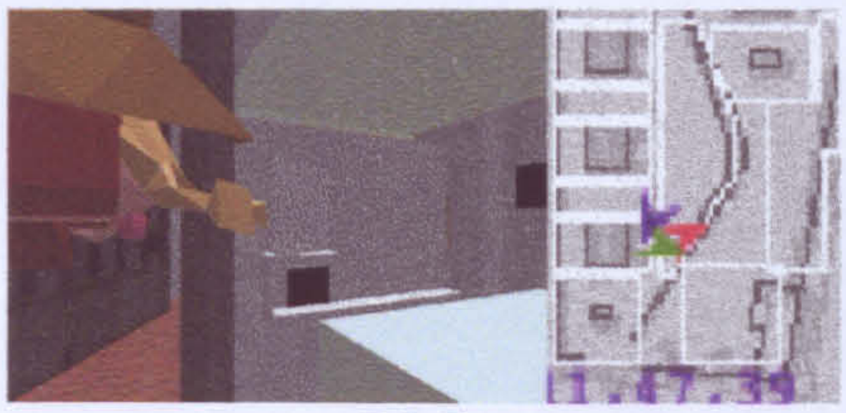
B: Do you like the Rosemary Mike? *5.3.4

R: Ahmm

G: *Rosemary* in *Nineteen fifteen*

R: I haven't found that yet *5.3.4

For the following two minutes, Blue (VE participant) and Green (local participant) kept exploring images on the timeline by contributing comments about images and information they could find on the timeline. They also established that some images were not available to remote participants. We rejoin the action as Red (hypermedia participant) manages to find the images in question.



5.3.5

5.3.6

B: I have one image Mike (Red) that you should have *5.3.5

R: [Which one is that? *5.3.5

B: [It's like wait it's [*Nineteen twenty five* and it's called *fetg* (.) [*fetges*

R: [*Fedges*

G: [(She walks towards the 1925 column on the *Timeline*.) *5.3.6

G: *Fetges* the town

R: Yes that's very nice actually (.) it's kind of [landscape

B: [It's nice eh?

R: [Yeah it's quite nice

B: [Yeah

G: Yes, that's the one I was talking before

R: Right

B: Really unlikely Mackintosh actually but

R: Yeah quite

G: (She laughs)

In vignette 5.2, the local visitor (Green) based on the indication on his handheld initiated conversation with the hypermedia participant (Red) about the content of the glass case in front of him in the *Willow Tea Rooms* display. This conversation started with a question from the local participant to confirm what the hypermedia participant was looking at. The use of questions as a mechanism for accomplishing shared alignment in front of museum artefacts is extensively discussed in (vom Lehn 2002). Green appeared to have assumed that Red was looking at knives and forks displayed in the case. Red however explained that he was looking at a black chair. Green started moving towards the image of the chair

on the wall. In the meantime the VE participant (Blue), who was in the other side of the room, started moving towards the displays area to find her friends. When she got to see them, she reiterated the question as to whether there were knives and forks in "that thing", i.e. the case. Red also located "that thing" in his web pages and confirmed that he had found what Green was looking at when he initiated conversation. As soon as Green and Red confirmed that they were looking at the same thing, "a cup", Green described the content of the display case by reading aloud the label. After that, he started moving away from the display but he turned back when Red announced that the object was lent by someone with the name David Mullane. This name appeared to be of some significance for Green who enquired further as to where this information was found. As the conversation went on about the name and the possible relationship between the lender of the artefact and Green, Green went back and forth around the case twice, looking at the content.

It is worth explaining here that the discrepancy in the information regarding the lender of the artefact was not intentional—nevertheless, it reflects the fluidity and changeable character of an exhibition. The content available to the remote participants was based on, and in most cases reproduced, the information on the gallery labels and captions. However, in the time between the preparation of the prototype and the user trials, the caption about the teacup in the gallery had changed. The new label did not include the information about the lender. The information in the mixed reality prototype had not been updated to reflect the change, so this piece of information was available to the remote participants but not to the local participant.

Vignette 5.3 also shows the interaction of the three participants in locating and discussing images on the *Timeline* display. The VE participant (Blue) announced that she could see an image of the painting *Petunias*. The local participant (Green) started browsing the *Timeline* and she also located the same image. They went on finding new images and expressing their opinion about them while the hypermedia participant (Red), who was located in a different information zone (image 5.3.4), could not participate in the exploration. Blue started giving Red more information about the images, such as the year they were painted. The latter

supported Red's alignment towards the images in discussion and was extensively used by all participants in their subsequent exploration of paintings. In this instance, the utterances and contributions to the conversation by the VE participant (Blue), initially, and the local participant (Green) subsequently, appeared to be sensitive to the context of the hypermedia participant (Red), and therefore 'designed' to facilitate his participation to the collaborative exploration (Sacks, Schegloff et al. 1974).

In the above described interaction, in both vignettes, one might observe two quite distinct forms of engagement with displays and specific features within displays: the process of establishing shared alignment and the exploration and appreciation of the display. Although the practice of achieving shared alignment was clearly distinguishable in the first vignette around the display case, in the second vignette shared alignment was an ongoing concern interwoven with comments about the display and expression of companions' opinions. In both cases, the overall interaction involved negotiation among the participants with regard to their personal point of view, their current engagement and description of the environment. The practices evolved smoothly, as there was no explicit coordination or affirmation involved as to whether one practice had finished and the next started, i.e. alignment and exploration blended into each other.

However, for the purpose of understanding the activity, it is worth paying attention to alignment, before the discussion turns to issues regarding the collaborative exploration of displays. For "the aligning of standpoints and production of a collaborative viewing of the exhibit is the starting–point that initiates the examination of the exhibit" (vom Lehn 2002: 87). Additionally, vom Lehn reported that, in collocated visits, a single exchange of glances may produce the alignment among co–visitors. As was shown in vignette 5.1, proximity of the participants, one's position in the gallery, orientation and pointing gestures are intrinsic aspects of conduct in the aligning of standpoints, as well as verbal summons such as the word "look" (Hensel 1987). Non–collocated participants also used location and proximity to each other to achieve alignment. However, this was not as straightforward as it appears to be among collocated visitors.

During the alignment stage, co–visitors worked on the assumption of what Schutz (1970: 183) described as the 'reciprocity of perspectives', i.e. the confidence on the interchangeability of standpoints.

> I take it for granted—and assume my fellow man does the same—that if I change places with him so that his "here" becomes mine, I would be at the same distance from things and see them in the same typicality as he actually does; moreover, the same things would be in my reach which are actually in his. (All this vice versa).

For example, in vignette 5.2 the formulation of Green's question to Red whether he was looking at "knives and forks" indicated Green's assumption that both of them were looking at the same thing since, according to his map, they were in the same spot and had similar orientation. However, in a visually rich environment such as this of the museum, the same location is often associated with a range of artefacts and interpretive material. The exact alignment towards one element of the environment—Aoki et al. (2000) called this "intimation"—is achieved by co–visitors through conduct primarily expressed in posture and gesture which were not supported in the Mack Room mixed reality system. The latter, as already described in Chapter 3, offered position and orientation information to participants.

Furthermore, the semantics of the position information of the three participants in the mixed reality environment were asymmetric. The position of the local participant indicated the participant's position, proximity and orientation to specific spatial features and exhibition content in the gallery, as it was recorded and reported by the tracking system. Whereas the position of the remote participants was an indicator of location within space which however did not discriminate with regard to exhibition elements in the wider information zone. Effectively, the system enabled a discrepancy among one's geographical position, and orientation and one's view. For instance, remote participants could access aspects of the exhibition that according to their representation within the system appeared to be outside their field of view.

Therefore, the work of aligning standpoints among distributed participants involved both establishing a common location in the exhibition and also achieving

alignment towards the same exhibition feature. The latter was essential for the collaborative viewing of artefacts. This is particularly obvious in vignette 5.3, where the local participant appeared unsure whether the painting she was looking at was the same as the one indicated by her remote friend, despite the fact that they shared the same title. Although in the mixed reality environment, the establishment of common location was supported by the position tracking resources in the system, the alignment towards the same exhibition feature, i.e. the confirmation of one's view, involved further verbal negotiation among the participants—a series of alignment–of–view related difficulties also arose in the collaborative exploration of artefacts inside CVEs (Hindmarsh, Fraser et al. 2001). Towards that end, participants developed specific techniques, such as reference to common information landmarks. For example, they used year indicators to confirm collaborative viewing of specific paintings (vignette 5.3); and they mentioned titles and names of artefacts and assemblies of artefacts as appeared on displays and so forth. At that level, the aligning work was collaboratively achieved through description of the desired viewing target and the working knowledge of each other's view. The latter will be further discussed later in this chapter.

From the moment that at least two of the distributed participants established common standpoints, their collaborative viewing of artefacts was developed through verbal communication. This included artefact–focused discussion as well as information regarding the location of a specific feature. The artefact–focused discussion involved contributions and exchanges by all parties in the form of label reading (McManus 1989) and relating label text to personal experience (e.g. vignette 5.2). The participants volunteered information about the artefact which might have been of interest to their companions such as the description of an artefact's decoration, its provenance, their own opinion about the aesthetics of the artefact and so forth. In that process, asymmetries in the presentation of the exhibition content across the different media proved particularly intriguing for the participants who were then motivated to explore the display further.

For example, in vignette 5.2, the local participant was motivated to re–examine the Willow Tea Room cup in three instances as information revealed by his

companion altered his appreciation of the artefact. In the course of their interaction, the two participants constantly confirmed and renewed the context of the appreciation of the artefact for each other through their contributions to the conversation. This socially negotiated and facilitated intelligibility of the artefact happened not only in the form of information exchange and establishment of shared factual knowledge about the artefact, but also with regard to the meanings that were associated with it. For instance, during the collaborative exploration, the tea cup and saucer was initially referred to as a "china cup" (in a museum case), it became a "tea cup and saucer from Mrs Cranston's Tea Rooms" in Glasgow, then became an object owned by one of the participants' relatives and subsequently a proof of that relative's wealth. On the other hand, the hypermedia participant was motivated to pay attention to and engage with an artefact that was not among the obvious ones on the webpage about the specific display.

In that respect, the hybrid state of the museum artefacts in the mixed reality environment, comprised by their asymmetric presentations on one hand as objects and "real things"—to use a popular museological term—and on the other hand as images, did not become an obstacle in the engagement with the artefact by the group. It rather became a resource for interaction, exploration, meaning making and appropriated which was socially organised. This claim does not suggest interchangeability between local and remote museum experiences. Instead, it recognises that by supporting social conduct among distributed participants it is possible to support a variety and intensity of engagement with the museum content for a diverse group of people, on–site and off–site.

5.1.3 Summary

This section discussed collaborative viewing and engagement with museum artefacts among both collocated and non–collocated visitors. The vignettes that were put forward for exploration indicated that collaboration at the exhibit–face is an evolving activity that is shaped through social conduct among the participants. Two forms of the activity were discussed in more detail, the alignment towards an artefact and the social interaction with and around displays. This present research as well as previous research by vom Lehn (2002) and Hensel (1987) confirmed that the common alignment towards an artefact is an essential and inseparable part

of the collaborative viewing of and engagement with this artefact.

Alignment in the *Mack Room mixed reality environment* was challenged by the communicative asymmetries introduced by the system, particularly the uncoupling of one's position with one's view. Location information was particularly used by the participants for their referential work, since being at the same location in the three different environments meant that co–visitors had access to a similar range of information. Being in the location was then a stepping stone for an interaction around displays. This secure knowledge was used by participants in various instances of co–orientation towards displays, for example by asking their co–visitors to come to where they were. It also led co–visitors to persevere with their effort to align towards a display. The section also indicated the practices developed by the participants to deal with the asymmetry in between one's location and one's view, by taking advantage of one's working knowledge of one's friends' view and using references fitting with a companion's environment such as informational landmarks, e.g. display titles, dates etc.

The asymmetries in the presentation and the availability of content to distributed participants were also discussed. The vignettes suggested that rich conversations and encounters took place at the exhibit–face as participants contributed information to the conversation, pointed out unnoticed aspects of an artefact and expressed opinions and personal taste. In several cases, asymmetries in the presentation of content intrigued the participants and triggered further exploration and engagement. In this aspect of engagement, asymmetries in the location information and the environment representations did not appear disruptive, since participants retained an awareness of each others' position and resolved fine grained orientation with verbal means.

However, social conduct among co–visitors is not only present in interactions at the exhibit–face. In group visits, it is also significant in the process of one becoming aware of artefacts or features of displays. It appears that one's attention and engagement is informed by one's companion's attention and vice versa. The next section explores the issue further.

5.2 In the process of becoming aware of artefacts

This section extends the discussion about social interaction around displays by exploring how co–visitors become aware of exhibits by virtue of their companions' conduct. The previous section pointed out, among others, that one's contribution in the exploration of artefacts is both influenced by the context of the activity and at the same time renews the context in which the activity will be developed. This section extends the argument to cover personal contributions to the visiting activity that do not happen in direct interaction with companions but instead are produced during personal engagement with displays, which subsequently may inform one's companions' engagement and the companions' interactions with each other. One's awareness of one's companions' activities is discussed as a resource for further interaction.

Visitor studies literature suggests that visitors discriminate not only between exhibits, but also within exhibits (Falk and Dierking 1992: 70). The reasons of discrimination have been attributed to the attractiveness of objects, as well as their size, lighting, position in the exhibition space (Bitgood 2002), e.g. objects on the ground floor appear to be more popular than artefacts displayed on other floors (Psarra, Grajewski et al. 2002) and so forth.

However, little attention has been given to the fact that social conduct may also have an effect on visitors' choices of artefacts. For instance, co–visitors explicitly invite their friends to an exhibit of interest, point out hidden or interesting features of exhibits and every now and then 'physically drag' their friends to their favorite artefact. Furthermore, people's activity around a display may also inform one's own conduct with respect the same display. As vom Lehn pointed out "viewing the exhibits is temporally organised and coordinated with the actions and activities of others in the same locale" (vom Lehn 2002: 68). This section also confirms this finding and suggests that a "locale", within which co–visitors may remain aware of each other's conduct, is subject to both perceptual and spatial factors. Furthermore, it explores how this notion applies to distributed visitors.

The notion of awareness of other people's activities as a resource for one's own

actions has been extensively discussed in CSCW, especially with reference to support of collaborative activities in the workplace. In that context, Dourish and Bellotti (1992) suggested that "awareness is an understanding of the activities of others, which provides a context for your own activity". This effectively means that in the course of a collaborative activity, "maintaining knowledge about others' interaction with the space and its artefacts becomes highly relevant" (Gutwin, Greenberg et al. 1996) to one's own actions and interactions. Furthermore, Gutwin (ibid.) drawing on related CSCW literature, suggested that there are four types of awareness: *informal*, *social*, *group–structural* and *workspace*. Although all types are relevant to workplace interactions since they cover from the general sense of who is around and what they are up to (*informal awareness*) to knowledge of people's roles and responsibilities (*group–structural awareness*) and fine grained awareness of co–participants in conversations and other forms of communication (*social awareness*), *workspace* awareness is particularly important since it recognises the influence of the environment and the activities within it on the collaborative work. Workspace awareness refers to one's up–to–the minute knowledge of another's interactions with the workspace.

A relaxed version of workspace awareness is relevant to museum interactions. The word 'relaxed' points out the fact that awareness in museum visits is not about successfully completing a task but is about making the most of an activity with friends. Furthermore, workspace awareness appears to put emphasis on the accomplishment of tasks by the individuals involved in a situation. In casual museum visits, however, awareness of one's companions' activities is often used as a practice to facilitate focused interactions among the companions, for example in the form of conversations, collaborative viewing of artefacts and so forth. It also facilitates one's own exploration of the exhibition as features or affordances of the displays become apparent through one's companions' conduct. Therefore, awareness mechanisms developed by museum visitors may be better understood as opening up opportunities for interaction with companions and artefacts rather than supporting achievement of specific visiting goals. The following section offers some insight into how awareness is interwoven with museum interactions.

5.2.1 Awareness of exhibits among collocated visitors

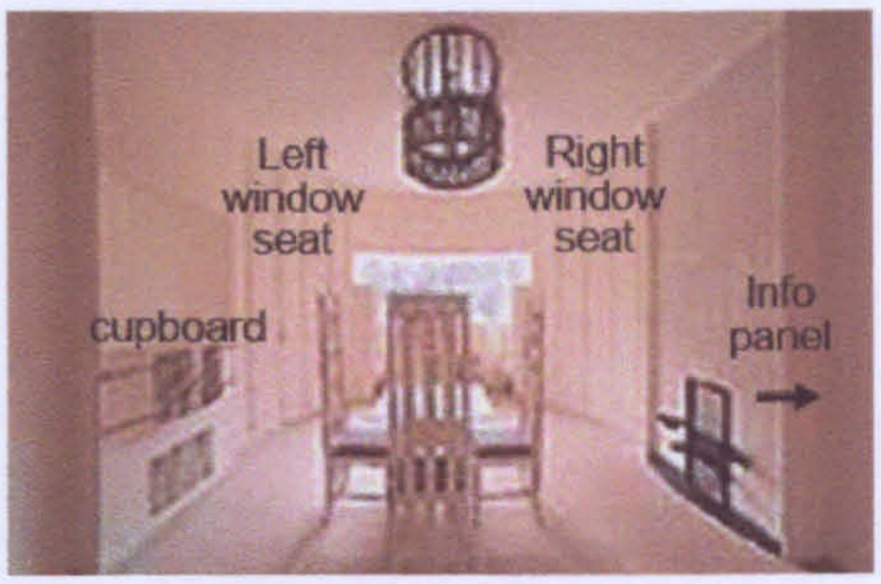
In the course of their visit, as co–visitors encounter displays, companions and other visitors, they constantly become aware of new displays or features of displays not only by virtue of their personal interest and attention but also by virtue of their companion's personal engagement and suggestions. This often happens explicitly, for example by asking one's friends to see something. It also happens implicitly through one's own engagement with a display. The fieldwork of this research reported that people in a group were aware of where their friends were and what they were looking at, and they took advantage of their friends' engagement to inform their own actions. The latter is the focus of this section. As Heath et al. (2002) showed, visitors also become aware of displays by virtue of other visitors' engagement, strangers to the group, but this aspect will not be discussed in this chapter.

In the visitor studies literature this aspect of casual museum visiting has been described as "modeling" (Koran, Koran et al. 1988). Experiments in museum settings informed by behavioural psychology indicated that visitors tended to copy the actions of fellow visitors and therefore the use of 'undercover' instructors in museums would potentially support the exploration of novel displays and would ease visitors in the appropriate way of viewing an exhibition. This section suggests that the behaviouristic explanation of the phenomenon does not cover the richness of the practice that involves becoming aware of and making one aware of exhibits. Fieldwork in the House for an Art Lover and the Mack Room indicated that one's location, the time one spends in the display and one's gestural behaviour, e.g. one's stance with regard to the display, are resources one's friends take advantage of to understand one's engagement with the displays. Being aware of others' engagement subsequently may become a resource for one's own attention and interaction. In that respect, one's companions' activity informs one's own action rather than being merely copied. The following vignettes from interactions among collocated visitors suggest the richness of the phenomenon.

Vignette 5.4

A couple (M and W) in their 40s visited the House for an Art Lover. Since that visit happened on a Saturday, they entered the exhibition space from the upper

ground floor, the main entrance to the building. We join the action as they explore the *Oval Room* (image 5.4.1), which is the last part of the exhibition area. It is worth noticing how M's engagement appears informed by W's actions.



5.4.1

W is listening to the "Oval Room" commentary (no 21) sitting on the left window seat. M is walking in the corridor outside the room listening to the audio commentary about the corridor. Then he comes into the room. He takes out his camera to take a photo of W. She is leaning forwards, outside the side panel of the window seat and smiles at the camera. He doesn't take the photo at first. W relaxes back in the seat. He takes his glasses off and he looks through the camera again, she assumes her posing position again and he takes the photo. In the meantime another visitor is reading the information panel on the right side of the door. M keys the commentary on his audio guide and starts listening standing around the table in the centre of the room. W gets up, goes to the cupboard, she opens and looks inside. Then she goes to read the information panel, which is now free. When M finishes with the commentary, he goes and sits on the right window seat (image 5.4.2), *then he goes and inspects the cupboard and then he joins W in front of the information panel. She explains to him that the photo on the panel is from Mrs. Cranston's house, which was demolished and that they used photos from this house to build the oval room in the House for an Art Lover. They discuss this in quite low but not whispering voice. M starts reading the panel and W leaves the room.*


5.4.2

Vignette 5.5

A couple (M and W) in their late 30s visited the Mack Room. They were moving around the gallery independently and they met occasionally in several instances. We join the action as the man found the remote CCTV camera display unoccupied. It is interesting to notice the interactions involved around his finding.

W is interacting with the "Furniture and Design" touch screen. M is watching a visitor operating the live tower camera display. He turns and joins very briefly W in front of the touch screen and then goes to the attendant and asks some information. He comes back into the main area of the gallery and he goes directly to the tower camera display that is unoccupied now. In the meantime W has finished exploring the "Furniture and Design" touch screen and she has moved to the side of the Hill House model. M says: "The camera is here" still looking towards the camera display and he starts manipulating the controls. W joins him at the display and she watches him manipulating the controls. After several seconds looking at the camera views, they turn and walk together to the "Hill House" display.

The two couples in vignettes 5.4 and 5.5 were separately engaged with elements of the gallery environment. In vignette 5.4 the woman was listening to the audio commentary while the man was taking a photograph of her. In vignette 5.5 the woman was exploring the information in a touch screen while the man was attending to the live camera display. However, all co–visitors appeared to be aware of the activities of their companions and other people in the proximity.

In vignette 5.4, the man's subsequent attendance to features of the *Oval Room* and his movement in the room appeared to be informed by the woman's previous engagement and led to the joint interaction with and around the information panel. Although one might argue that the attendance to specific features in the room was due to their mention in the audio commentary, the timing and the nature of the actions suggest that the two visitors were also aware of each other's conduct and that they had also organised their conduct accordingly. For instance, the audio commentary described the cupboard but did not encourage visitors to handle it; additionally the text on the information panel was very similar to the narrative on the audio commentary, with the additional photographs and information about Mrs Cranston's house, which in vignette 5.4 is the only piece of information mentioned by the woman to her conversation with the man.

Furthermore, in vignette 5.5, the man remained attending to the live camera display while he announced his discovery to his companion. The timing of the announcement is of particular significance in this instance, since the man produced the announcing utterance the moment that his companion was in a position in the gallery to locate him and the display quickly. Had the utterance been produced earlier on, when the woman was interacting with the touch screen, the wall structure of the display would have impeded both her audio and visual access to her companion. Similarly, had the utterance been produced later, when the woman had proceeded from browsing the glass case to interacting with another touch screen or viewing one of the videos, it would have been at risk of being ignored.

In the above vignettes, co–visitors appeared to organise their conduct towards the exhibition and each other in a manner that indicates that both members of the two groups were aware of each other's activity. The proximity of the participants and their maintenance of position within perceptual range were resources used by the visitors to remain aware of their companions and design their own conduct accordingly. These conditions were also combined with judgments regarding one's companion's personal interests, attention and availability. For example, the timing of the utterance produced by the man in vignette 5.5 and also the timing of the man's movement to join the woman in front of the information panel in vignette 5.4 suggest that visitors in the course of their own activity also visually and/or audibly remain aware of the activity of their companions.

However, being aware of a situation and acting upon this awareness is a more complicated matter than mere practicalities of social conduct. In museums, unlike safety critical settings, awareness of one's engagement does not necessarily have a direct impact on one's own attention and engagement. For example, in vignette 5.5, M was aware of his companion's interaction with the touch screen but this did not lead to his own engagement with the same touch screen. In fact, in the course of the overall visit, M did not interact at all with that specific touch screen. In other cases in the fieldwork, one's interaction with a display appeared to be followed by one's companions' interest to the same display. In that respect, the way one presents one's engagement with and personal interest to specific artefacts

may operate as a recommendation for co–visitors to follow (or to ignore).

These 'silent' recommendations, however, are also intrinsically coupled with one's awareness of one's companions' status with regard to one's availability and location, and also one's engagement and interaction with artefacts and related interpretive material. For "the way in which individuals accomplish awareness is inextricably embedded in the activities in which they are engaged" (Heath, Sanches Svensson et al. 2002). Through this practice, casual museum visitors appear to maintain a sense of common engagement with the exhibition, find topics for discussion, facilitate collaborative viewing of artefacts and initiate focused interactions with each other and with exhibits. This claim is also supported by findings in research regarding electronic guidebooks. Aoki et al. (2002) suggested that the opportunity of eavesdropping in the *Sotto Voce* electronic guidebook increased visitors' appreciation of the exhibition overall and supported more discussions among participants.

The following section examines how one's awareness of one's companions' actions was achieved and handled in the *Mack Room mixed reality environment*.

5.2.2 Awareness of activity among non–collocated visitors

The previous section looked at incidents of awareness as a resource for personal engagement and interaction among collocated visitors. It indicated that awareness is not a separate activity but is interwoven with one's focused interaction at any time. Awareness among casual co–visitors is not organised with an aim to successfully achieve a task; rather, it is an aid to personal exploration and enhancement of the shared experience. In a similar fashion, but through different means, distributed participants in the mixed reality user–trials extensively used each other's conduct to inform their own engagement.

The mixed reality museum environment afforded various degrees of awareness; it supported location and orientation awareness through presentation of movement tracking information—however, in an asymmetrical character that was described in the previous section. It also afforded a degree of awareness of the participants' engagement with content, based on common organisation of exhibition content

across the different media around a spatial metaphor. Additionally, it afforded awareness of audio cues through the always–on audio channel. The field studies suggested that the main means of one remaining aware of one's companions activities in the mixed reality environment was by visually monitoring one's companions' location in combination with verbal communication. In that context, participants followed their friends around or explicitly asked them what they were up to, since traditional visual cues such as posture, gesture, gaze etc. were not supported by the system. The following vignette offers an insight into the situation.

Vignette 5.6

The three participants were wandering around the exhibition space. Green (local participant) was looking at the *Glasgow School of Art* display. Blue (VE participant) was looking at the *78 Derngate* display. We join the action as Blue communicates her engagement with an element of the *78 Derngate* display on the open audio channel. It is interesting to notice how her communication raised the awareness of the display among her companions and informed their subsequent actions.

B: I am looking at the reconstruction of the guest bedroom in the Hunterian Art Gallery

G: Is what you are looking at? (He checks his hand held) *5.6.1

5.6.1

B: I am. Quite stripy!

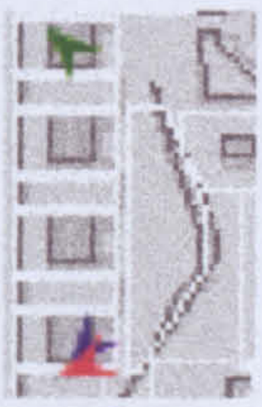
R: [(She moves next to Blue.) Oh, me too now *5.6.2

G: [(He examines the contents of the display case in front of him.)

B: I am not so sure about all these stripes I think I would feel a bit disturbed at night

R: [Yeah

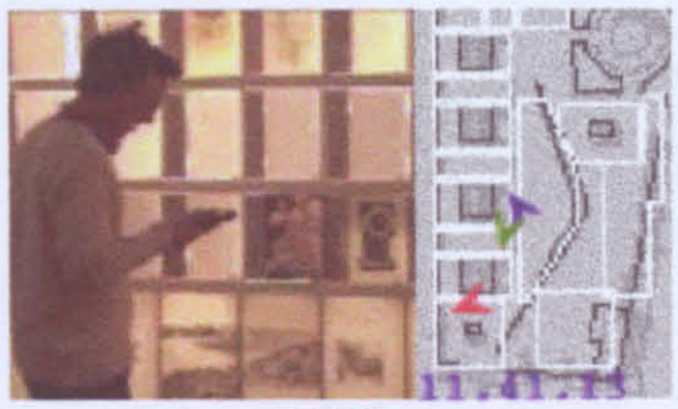
G: [(He walks to the GSA model and then examines the tower camera display.)



5.6.2

For approximately a minute the three participants kept examining the information at their locales without conversing. We rejoin the action as Green checks his hand held and starts moving to the direction of Blue and Red while Blue starts moving to the direction of Green.

G: (He stops and looks at the handheld.) Do you know where I am passing? (3) Did you see me go by? *5.6.3



5.6.3

B: I see, I did, where are you going? (*5.6.3) I am gonna follow you again. (She changes orientation) *5.6.4

G: (He keeps walking behind the display.) Oh are you? I was going to the bit that you were looking at which was *5.6.4

B: (She keeps moving to the direction of Green but she loses sight of him, since he is hidden by the display wall.) I've just walked into (.) oh (.) where did you go again?

5.6.4

G: Well I was looking

B: Who's the hat?

G: [Hm, where

B: [(Inaudible)

G: (He laughs and he checks his hand held.) (5) (In loud voice) What was the exhibition you were looking at before? *5.6.5

5.6.5

B: It was the

R: The Hunterian Art Gallery (She moves to the *78 Derngate Street* area on the map.) *5.6.6

5.6.6

B: The Hunterian Art Gallery, the *guest bedroom*

G: (He checks his handheld and he walks to the other side of the display.)

R: Yeah

B: A very stripy bedroom *5.6.7

5.6.7

G: (He looks at the display.) Ok that's where I am now

B: Can you see there's like two two twin beds and and blue and white stripy wall paper

G: (He stops and looks at the picture.) Yeah, horrible shape, terrible *5.6.8

B: Oh I think it's bad from here

G: Well it probably wouldn't go in your room

B: No it wouldn't imagine waking up

G: (Inaudible)

B: Imagine waking up with a hang over

G+B: (They both laugh)

5.6.8

In vignette 5.6 the VE participant (Blue) initially announced over the audio channel what she was looking at. She also expressed her personal opinion about

the look of the specific room. In the mean time, the local participant (Green) was looking at another display in another part of the gallery. Although his attention was focused on the display in front of him, he also peripherally participated in the engagement of his companions—as shown by his acknowledgement of their activity ("Is what you are looking at?"). Furthermore, he checked his handheld to see where in the gallery his friends' interaction was taking place. When he finished looking at the display in front of him, he started moving towards the location where he had noted that the "stripy" bedroom was featured. He did that despite the fact that this choice involved walking from one side of the room to the other, overlooking the exhibits in between. While the local participant was moving towards the display in question, the VE participant moved away from it, and when they met up, the VE participant decided to follow the local participant back to where she had come from. This decision was verbalised but also acted upon, as shown by the new orientation of the blue arrow on the map (images 5.6.3, 5.6.4).

From the participants' interactions in vignette 5.6, it is evident that the distributed participants throughout their visiting session remained sensitive to each other's movements and engagement. For example, the hypermedia participant "jumped" to the *78 Derngate Street* display as soon as the VE participant mentioned what she was looking at. Furthermore, the local participant set out to find the exhibit that his friends were looking at as soon as he finished looking at the exhibit in front of him. Additionally, the VE participant changed her direction to follow the local participant. Their awareness of each other's activity was based on the use of location information but also on the verbal communication about what was featured in the specific location.

The latter was a practice developed by the participants to confirm their orientation and attention within a wider location. Participants appeared to almost constantly self–report position with reference to exhibits in the proximity, by mentioning the title of the exhibit and by describing a specific artefact when necessary. Location information and verbal communication were then used to support common orientation and more focused interaction among the participants.

It is worth noticing that achievement of awareness among participants and with aspects of the exhibition was almost inseparable from personal attention to the exhibition (Heath, Sanches Svensson et al. 2002). Blue's comments about the stripy bedroom were both related to her personal appreciation of the exhibit and her organisation of conduct in making her friends aware of her engagement. Furthermore, the local participant's awareness of his companions' attention was achieved within his engagement with the *Glasgow School of Art* display by quickly checking his map on the handheld. Additionally, the local participant's awareness of his companions' appreciation of the exhibit became a resource for their subsequent interaction around the exhibit. This was evident in the development of discussion about the exhibit where Green's comment that that decoration wouldn't fit with Blue's (bed)room, appeared to refer back and elaborate on the initial comment by Blue that she would feel disturbed at night if she was to sleep in a room with that decoration. The latter was expressed when Green was still looking at a different display. However, both participants appeared to both produce and recognise conduct on the assumption that not only both of them were aware of each others' activity but also that each was aware of the other's awareness.

This case indicates that interaction among companions is not strictly based on proximity but more generally on awareness of each other's activity. In the *Mack Room mixed reality environment* location awareness and real–time audio became valuable resources for participants to remain aware and monitor their friends' actions. Furthermore, the vignettes discussed in this section suggested that, in distributed group visits, rough knowledge of one's companions' location is a sufficient resource for maintaining awareness of one's companions activities. However, more detailed location information in combination with explicit verbal interaction is required for achieving collaborative alignment and viewing of artefact, as was discussed in section 5.1.

5.3 Conclusion

This chapter looked at social conduct among co–visitors around museum displays. Drawing on vignettes from field studies it looked at social conduct and

collaboration among collocated visitors and among distributed visitors in a mixed reality museum environment. The development of the chapter was based on the discussion of these vignettes and explored two related topics: social interaction among co–visitors at the exhibit–face, and awareness of activities as a resource for social interaction and collaborative appreciation of artefacts.

This chapter suggests that collaborative appreciation of displays among collocated visits is a situated activity that is organised among the participants in and through social conduct. The participants' conduct takes advantage of many local resources, such as one's companions' proximity, location, orientation and attention. Those resources facilitate common alignment towards artefacts and collaborative viewing. Additionally, the collaborative engagement with artefacts is sustained through personal contributions to the artefact appreciation, often in the form of conversation. The contributions may be supported by content available locally but are also enriched with information that has been accessed previously in the visit or in other visits.

Similar notions of collaborative exploration of displays also apply to distributed museum visitors. However, a big part of the conduct among distributed visitors at the artefact–face is about achieving alignment for collaborative viewing. Distributed participants achieved alignment by combining information about one's location with verbal communication and one's working knowledge of one's companion's view and attention. In that respect the hybrid character of the mixed reality museum environment and the inherent asymmetries in it may be seen not necessarily as inhibiting interaction but also as enabling diverse perspectives on the exhibition. This diversity may also be used as a resource for further exploration and discussion.

This chapter also suggested that one's awareness of one's companions' engagement may lead to further personal engagement with artefacts and people. Drawing on vignettes from both collocated and distributed visitors, it argued that co–visitors' awareness in museum visits does not serve the successful achievement of personal and collaborative tasks, like workspace awareness, but operates as a facilitator for focused interactions. Furthermore, one's awareness of

one's companions' activity is accomplished through the practices that are involved in the activity. In collocated visits, visitors' awareness of their companion's activities is particularly afforded by visual cues. However, in the *Mack Room mixed reality environment* verbal communication often functioned as an awareness mechanism. The latter will be further discussed in Chapter 8.

This chapter focused on social conduct that inspired and was inspired by engagement with museum artefacts and the overall exhibition material. The next chapter extends the discussion beyond museum artefacts and explores the manifestation of social conduct in the management of casual group museum visits.

6 | Collaboration beyond displays

The previous chapter focused on interaction around displays and how it is socially negotiated, facilitated and enriched among collocated and non-collocated visitors. As was mentioned in the introduction of this thesis, the study of visitors' engagement with and around objects, such as interaction around displays, often dominates the research in the area of collaborative museum visits. However, the observational studies of collocated visitors highlighted that collaboration in the visit happens not only when people explore displays together but also throughout the visit, in activities that surround and connect exploration of displays. In both museological and technological literature, activities that happen in the periphery of the artefact exploration but at the same time are intrinsic and essential elements of the overall visiting activity, such as the pace of the visit, the initiation of the visit and so forth, are often overlooked.

The aim of this chapter is to focus on these aspects of the visit that are usually referred to as management of the visit. It particularly examines the initiation of the visit and the production of shared pace among casual museum visitors[18]. These aspects of the visit, despite being overlooked by current visitor studies literature, present several challenges for group museum visitors as well as opportunities for social participation and interaction. Furthermore, they are important for the collaborative achievement of the visit since they are practices people use to stay together during their engagement with an exhibition. Moreover, the initiation and pace of group museum visits appear to be dynamic, socially negotiated, and decided upon according to the situation at hand.

The discussion in this chapter is based on the presentation and discussion of relevant vignettes, in a fashion similar to Chapter 5. In addition to vignettes from the trials of non–collocated visitors, extensive vignettes from the study of collocated visitors are also included in this chapter. This was necessary not only because they offer points of reference for the discussion of non–collocated visits

[18] The closing of a visit is also of interest and relevance for the understanding of the management of the visit in casual co–visiting. However, the setting of the user trials, as it was discussed in Chapter 3, did not support a detailed understanding of visitor interaction during the closing of the visit—since the closing coincided with the completion of the activity–based part of the session. Further research will be beneficial towards that direction.

but because they directly contribute to our understanding of initiation practices and pace organisation in casual group museum visits overall.

6.1 Initiation of engagement

The beginning of a traditional museum visit is often organisationally and structurally defined by the museum or cultural institution. A series of architectural features and exhibition features such as banners, and organisational arrangements, foremost the acquisition of tickets or a gallery's floor plan, are used to define the beginning of the visiting activity. Museum literature in particular points out the need for the museum to facilitate the beginning of the visit by offering a welcoming and inclusive environment that supports clear and quick orientation of the visitors (Communications Design Team 1999). Maps, floor plans and interactive digital systems (Nicholas) in foyers of museums are usually implemented to facilitate visitors' orientation and visit planning.

In on–line virtual museum collaborative environments, the initiation of the visit is often defined by an introductory page that prompts on–line visitors to enter a user name and a password in order to join the environment. This follows the traditional starting mechanism of other CVEs, such as *Active Worlds*, *There* and so forth. The initiation of the visit, however, among visitors who join together or who may want to visit together is not further supported apart from the conventional CVE resources, in the form of avatars, chat facilities etc.

In the field of collaborative system research, issues of initiation of a collaborative activity are usually discussed within the topic of session management (Edwards 1994) and they particularly focus on identifying ways that may facilitate the initiation of collaboration around a specific activity. Despite the different approaches in the way such systems support initiation, they are biased towards collaborative activities that have a specific goal or task orientation, common to all participants involved (Edwards 1994). Some other studies of activity initiation focus on the initiation of interaction (Adler and Henderson 1994; Kristoffersen and Ljungberg 1999) in general. Findings of these studies, for example the notion of interaction as always interrupting, or replacing interaction and the role of

objects in establishing interactions (Kristoffersen and Ljungberg 1999: 7) are useful for this thesis too.

6.1.1 Initiation of the visit among collocated visitors

In both the House for an Art Lover and the Mack Room, formal procedures preceded and signaled the beginning of the visit. In the Lighthouse, upon entrance in the Mack Room, visitors were asked to display their tickets. In the House for an Art Lover, visitors were also asked to buy their ticket and they were offered a leaflet about the house, an audio guide and brief instructions as to how they could operate the audio guide. The possession of a ticket entitled a person to be in the designated exhibition space for the public. From the institution's point of view, the acquisition or the display of the ticket changed one's status from a 'potential visitor' to a 'visitor' in the museum or a specific gallery respectively, and differentiated oneself from other people who were also entitled to be in the exhibition space, for example participants in other functions such as concerts. However, the activity of 'visiting an exhibition proper', this being engaging with the exhibition's artefacts, information and space, did not necessarily coincide either with this initial contact with the museum staff or with the moment of entry in the exhibition space. The initiation of the visiting activity by casual groups of visitors and the practices they employed to achieve it collaboratively is the focus of this section.

A set of vignettes from the House for an Art Lover may help the reader to better grasp the negotiations, practicalities and issues involved when a group of visitors starts a visit.

Vignette 6.1

A group of two middle aged women visited the House for an Art Lover. Since the visit happened on a Monday, they entered the building from the lower ground floor, through the shop entrance. They stayed in the exhibition areas of the house for approximately one hour.

A group of middle aged women (W1 and W2) arrived at the House for an Art Lover at around 12:00 noon. They bought their tickets and audio guides and went upstairs. They sat on the bench in the video

room and they watched the whole video without talking to each other. At the point where the video shows the cabinet in the Oval Room, W1 commented on how detailed it was. When the movie finished, W1 took an extra copy of the 'dinner concerts' leaflet [from a leaflet holder next to the video room door] and then they went out of the room with direction towards the house. I stood up, I left the room and I walked towards the swing doors. Before they passed the swing doors W2 turned to me and asked me if they should go to the interpretation area first. I replied that I was not so sure and that it was up to them to start wherever, still facing towards the House. W1 suggested to W2 that "we should start from the house where the original entrance was". They finally turned and walked into the MacDonald interpretation area first. They both started looking at the gesso technique display (on the left side of the room).

Vignette 6.2

A group of four, young people (in their 20s) visited the House for an Art Lover. Since the visit happened on a Saturday, they entered the house from the main entrance in the upper ground floor, walked through the small hallway and entered the *Main Hall* where the attendant's desk was situated at weekends.

At around 11:30 am, a group of four arrived in the House for an Art Lover: three women (W1, W2, W3) and one man (M1). They came in the foyer and they bought their tickets. They were quite jolly and they were chit–chatting with each other. They got the audio guides and the leaflets from the attendant who briefly explained to them how to use them. They stood not far from the attendant's desk and they looked at the audio guides, trying to figure out how they worked and what to key first. W2 said that "it's number 2" pointing at the index card on the side of the door. All of them keyed 2 and started listening to the introduction commentary. All four of them were spread in the room and leaned on the wall with their backs to the windows and facing toward the mezzanine balcony.

In the two vignettes, the groups of visitors obtained their tickets, audio guides and leaflets from the attendant and they proceeded to start their engagement with the

exhibition. The initiation of their engagement, however, did not happen automatically with the acquisition of tickets, but was socially negotiated and decided among the group and, in the case of vignette 6.1, in relation to other people who were present in the situation. Furthermore, this negotiation did not involve only the question "where should we start from" but also a series of shared preparations that preceded the final decision about the question[19]. For example, in vignette 6.2, the members of the group reconfirmed with each other the operation of the audio guide so that they were all ready to start their engagement as a group. In other cases in my field studies, visitors were observed to wait for each other to put away leaflets and tickets before they started engaging with audio commentaries or other aspects of the exhibition.

Furthermore, the decision regarding "where to start from" is also socially negotiated by the members of the group. Artefacts, architectural elements and other objects in the exhibition space, such as the commentary index panel in the House for an Art Lover, are resources for the members of the group to use in their negotiation. On the other hand, ambiguity in environmental indications involves further negotiation that might implicate the activity of other co–present visitors as well as the previous knowledge and experience of the participants. For example, in vignette 6.1, where visitors were forced to enter the exhibition space from its exit point, they appeared uncertain whether they should start from the end or indeed move to the original entrance and start their visit form there.

Additionally, the 'start' of the engagement with the exhibition does not necessarily happen upon entrance in the exhibition space. In vignette 6.1, the two women appeared uncertain as to where they should "start from" despite the fact that they had sat through a twenty minute informative video about the house, which in itself could be acknowledged as the start of the visit. Furthermore, in vignettes 6.1 and 6.2, the final resolution of the problem "where to start from" coincided with the personal engagement of each individual with an aspect of the exhibition e.g. looking at and reading labels and listening to audio guides. For the

[19] Heath (1984) reports that in medical consultations and other similar professional–client interactions, the movement into topic is typically achieved through the production of a topic–initiating turn spoken by the professional. This usually follows the patient's "display of recipiency", hence his/her availability for interaction.

initiation of museum engagement, among the members of a group, is experienced as an adjustment of each individual's attention: from focusing primarily on the social interaction with friends to also focusing on another aspect of the environment, the exhibition. The timely collaborative production of actions that were recognised by the companions as typical museum behaviour—and they are indeed well reported as such in visitor studies—facilitated the transition between the start of the visit and the initiation of the visiting activity. In vignette 6.2, it is the socially accomplished character of the initiation that makes the passage from vivid, lightweight group interaction to isolated, individual engagement appear natural and unproblematic. From that point onwards visiting rules—whatever those might be—would apply.

6.1.2 Initiation of the visit among non–collocated visitors

In the *Mack Room mixed reality environment*, the initiation of the visit presented a series of challenges for the participants. As one might expect, participants in the mixed reality trial sessions spent some time explaining their environment to their friends. This often involved a lot of discussions and jokes about the appearance, features and capabilities of the avatars, and the individual user interfaces. Floating heads, blue arrows and green blobs captured the imagination of the participants who found them scary, fantastic, boring or even having their own will. Furthermore, the participants were initially connected to the environment at different times, with the remote participants connected first, followed by the on–site participant. In some cases, remote participants took this opportunity to explore the environment they were in and briefly engaged with some of the artefacts. Under the circumstances of trial sessions, one would expect that the script of the trial—loose as it was—would have inadvertently influenced the practices involved in the visiting activity. However, the collaborative negotiation of the initiation of the visit appeared to be of importance for non–collocated visitors, as for collocated visitors, as is shown in the following vignettes:

As before, in the following vignettes Green (G) is the on–site participant, Red (R) is the hypermedia participant and Blue (B) is the VE participant. Square brackets ([) indicate overlapping talk; *italics* indicate text borrowed from the museum labels; numbers in brackets indicate pauses measured in seconds (a single full stop in brackets indicates pause less than 1"); a star (*) indicates the position of images in the overall action.

Vignette 6.3

Green (local participant) and Blue (VE participant) were close friends, authors, and museum and Mackintosh enthusiasts who lived in Glasgow. They had already visited other Mackintosh attractions but they had never been inside the Mackintosh Interpretation Centre. We join the action 9 minutes after the VE participant (Blue) was introduced to the system and 4.15 minutes after the on–site participant (Green) started walking inside the gallery with the handheld. It is worth noticing the quick verbal exchange that leads to the initiation of the visiting activity.

B: There you are (.) yeah *6.3.1

6.3.1

G: (She stops walking and she looks at the handheld.) Can you see me actually? *6.3.2

6.3.2

B: Yeah

G: I'll I'll come to you

B: Yeah

G: (She turns and she faces towards the remote camera monitor and the banner with the photograph of old Glasgow.) Ok *6.3.3

6.3.3

B: You look quite (laughing)

G: Alright I will start looking at some things I think (.) so (She starts walking towards the Glasgow School of Art display.)

B: (.) Ok

G: (She walks towards the Glasgow School of Art area looking at her handheld.) What would you recommend since you've been in this room for a while? (She looks towards the display.)

B: [Ehmmmm

G: [(She looks at the case in front of her.) *6.3.4

6.3.4

B: (.) That thing about [Hill House is quite attracting and (Inaudible)

G: [(She starts moving to the other side of the room.) Do you know where that is?

Immediately afterwards, the two participants found the *Hill House* display and they engaged in discussion and appreciation of the "principal bedroom".

Vignette 6.4

Green, Blue and Red were friends and colleagues. We join the action 4 min after the remote visitors (Blue and Red) were introduced in the system and 1.5 min after the on–site participant (Green) joined them. The participants' repeated attempts to initiate collaborative engagement are of particular interest here.

B: You do have pigtails Eric (Green)

G: Do I? (He is facing the exit of the room.)

R: (She laughs.)

G: I always wanted pigtails

B: (Inaudible)

R: (She moves further up the map.).

G: (He looks at his handheld.) Ok, shall we (He turns looking at his handheld.) Oohhh *6.4.2

6.4.1

G: I am going to follow Geiza (Red) then around here yeah (He turns towards the exhibition still looking on the handheld.)

B: I am gonna follow you then (She starts moving further up.)

6.4.2

G: He starts walking towards the tower

R: [Hmmmm

B: [This is great (laughing)

G: (3) Ohhhh can you see this thing I am standing in front of? *6.4.3

B: It's a chair *6.4.3

R: It's the (inaudible)

G: Nooo it's not a chair. It looks like a nice pretty ehm model building thing which is this building in fact

6.4.3

B: Ah

R: Ah yeah, I think that I've

B: It looks like you are seeing a chair

G: (He laughs.) A chair is in the corner (he points at chair) to (.) to (.) my right

For the following 1.10 minutes the three participants tried unsuccessfully to orientate themselves towards the chair. We rejoin the action immediately after that incident.

G: I am looking at the chair at the minute but I've noticed that my little icon is (inaudible) off at the other side of the room

6.4.4

R: (She laughs.)

G: It's going visiting by itself *6.4.4

R: Yeah

G: Ehm I'll just try catch up with myself in another part of the gallery (He laughs and walks to the other side of the partition wall.)

6.4.5

R: (Jumps to the tower area.)

B: Oh now Geiza (Red) is gone

R: Yeah, I've just been to this round thing in the corner (.) but *6.4.5

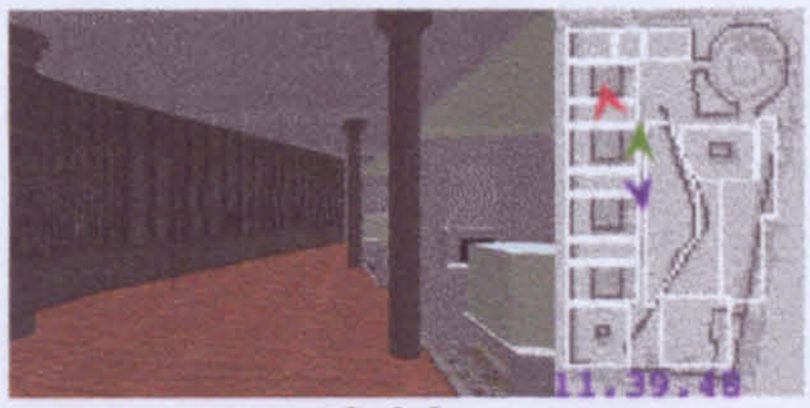
G: (Stops in front of the *Timeline* and watches the handheld.)

R: (15) Eric (green) you are awfully jumpy there

(They all start discussing about the local visitor's icon laughing and joking.)

37 seconds later:

B: I am going to go and look at the exhibit (She starts moving towards the centre of the room) *6.4.6



6.4.6

G: Ok

After that moment the participants took interest in specific displays: the on–site visitor started exploring the *Glasgow School of Art* display and the two remote participants started chatting about the "guest bedroom" that was featured in the *78 Derngate Street* display[20].

It is necessary here to clarify some of the events presented in vignette 6.4. The three participants tried for 1.10 minutes to align themselves towards a chair. According to the on–site participant, that chair was in the corner (image 6.4.4), whereas according to the VE participant the chair was on a stand in the middle of the room (image 6.4.3). The discrepancy in the two views was based on the fact that in the time between the construction of the 3D model of the gallery and the trial sessions, the chair was physically moved from the stand to the corner of the room. During the trials, the position on the stand was occupied by an architectural model of The Lighthouse, which had been on loan previously. The digital 3D

[20] Subsequent interactions were also discussed in vignette 5.6, Chapter 5.

model, however, was not updated. The two participants were not aware of this discrepancy. Furthermore, the hypermedia participant was able to see a photograph of the stand with the model on but there was no image of the chair available in the system. Therefore, the alignment of the participants' views was problematic in that instance.

Vignettes 6.3 and 6.4 show the moment when the participants in the mixed reality environment tried to initiate their visit. The initiation of the shared visit appeared of importance for them. For example, in vignette 6.4, the participants attempted three times to collaboratively establish the beginning of the visit. The first significant step of their negotiation was to establish that they were close to each other and were able to see each other—Heath (1984) refers to this state before the initiation of talk in topic as a state of co–presence that is important for the initiation of a medical consultation. For example, in vignette 6.3, the moment the two participants confirmed that they could see each other ("Can you see me actually", "Yeah") the on–site participant announced that she would start looking at some things and she subsequently asked her companion to suggest some displays to explore. Similarly, in vignette 6.4, when the on–site participant established that they were all close together by checking his handheld (image 6.4.2), he suggested that they should move on. His utterance "Ok, should we" in combination with his body turn indicates both his confidence that his companions were also ready to move and his intention to explore some displays (and also get on with the trial). Since the on–site participant was closely attending to his handheld map during this process, it would be safe to infer that his suggestion to move on was also influenced by Red's action to jump onto a new position further inside the room in the meantime (image 6.4.2).

Unlike the initiation of the visit among collocated visitors that coincided with the shift of the individual's attention to specific aspects of the display, the initiation of the visit for the non–collocated visitors coincided with the attempt to collaboratively engage with displays as a group. It was the success of this first attempt to collaboratively engage with an exhibit that differentiates the two vignettes, since in vignette 6.3 the attempt was unproblematic whereas in vignette 6.4 it was unsuccessful. This led the participants in vignette 6.4 to focus on

aligning their views, which also proved unsuccessful due to the discrepancy in the design of the 3D model. It also delayed the initiation of the engagement with the exhibition. A subsequent discussion regarding the movement of the local visitor's icon added further delay in the initiation, which was achieved when the VE visitor explicitly announced that she was "going to look at the exhibit" and started moving away from her companions.

It is evident that the features of the system, especially participants' representations, such as icons and avatars, and discrepancies in the presentation of the environments can become an inexhaustible topic of conversation and social interaction. In that respect, the role of icons, avatars and their reported behaviour in the system changed from 'resources' for social awareness and interaction to the 'topic' of the activity (Brown and Bell 2004). Although discussions about the mediating technology were to be expected with novel technology (configuration of technology happens with more conventional museum systems, such as audio guides) and might facilitate participants' familiarisation with and appreciation of the different environments, in the instance of the initiation of the visit the technology as a 'topic' conflicted with the 'topic proper' of the activity, which was the engagement with the exhibition.

However, a closer inspection of the vignettes presented here shows that it is not the engagement with the displays that was hindered by the conversation about the technology. Different participants in different moments of the visit initiation process briefly engaged with a range of displays, for example in image 6.3.3 the on–site participant glanced at the *Mackintosh's Glasgow* display while her remote companion was commenting on the appearance of her avatar. Similarly, in vignette 6.4 during the 15 seconds of silence, all participants were engaged with some information about the exhibits. Their engagement, however, in the form of looking at displays, reading labels and so forth was not available to the other participants—their location and orientation being the only indication of engagement afforded by the system. In other words, the cues produced regarding one's engagement were not the cues received by one's companions and vice versa (Heath and Luff 1992a). In that respect, the verbal communication of intentions regarding the focus of each participant's attention, in very precise form indeed,

e.g. "I am going to go and look at the exhibit", facilitated the collaborative appreciation of the situation in hand and achieved the initiation of the shared visit.

6.1.3 Summary

The initiation of group museum visits, both collocated and non–collocated, is socially organised and negotiated. In collocated visits, initiation happens some time after the visitors' entrance to the exhibition space and it defines the beginning of the museum visiting activity, hence the shift in one's attention from group–based interaction to also personal engagement with and exploration of the exhibits. Therefore, it also defines a shift in the way one's behaviour should be perceived by the rest of the group. In the mixed reality environment, the initiation of the visit also appears to be of importance for the group. The initiation of the visit, however, does not necessarily assume the personal engagement with a display; it rather initiates the collaborative engagement with displays.

In each case, the production and recognition of cues that are indicative of one's engagement with the exhibits is essential for the initiation of the visit. In collocated visits, these cues are both visual and verbal and often implicate objects that are available in the environment as well as other co–present visitors. In the non–collocated visits, as they were studied in this research, the produced cues were primarily verbal and descriptive of one's focus and attention. This finding suggests that the provision of means, through which one's 'readiness' or intention to initiate exploration of an exhibition can be communicated to one's companions, would be beneficial for the organisation of the initiation of the visiting activity among distributed participants. Aspects of this issue will be further discussed in the following section.

6.2 Pacing the visit

This section continues the discussion on the relation between personal and social engagement with the exhibition during a casual group museum visit. It further enriches the discussion by looking at the creation and sustaining of shared pace throughout the visit. The achievement of collaborative pace is often overlooked by visitor studies, which usually focus on social interaction around specific displays,

as was discussed in Chapters 2 and 5. However, the study of practices involved in the achievement and management of pace in group museum visits may indicate how co–visitors connect artefacts and activities together in one coherent and collaborative visiting activity. Therefore, it arises as an essential aspect of studying and understanding the role of social conduct in collaborative visits among both collocated and distributed companions.

Pace is commonly defined as the manner of stepping or running, as well as the speed or rate of progress. It refers to movement within geometric or geographic space as well as the rate of accomplishing an activity such as speaking or reading. (Oxford English Dictionary Online). When pace is used to describe movement through space, it also carries a sense of directionality or directedness, hence progress toward a goal. One's pace is also influenced by time constraints and features of the environment such as terrain, crowds, mode of transport and so forth.

Pace in museums is usually discussed in association with the notions of learning and visiting styles, to point out that visitors have their own individual pace in the exploration of the exhibition. On the other hand, according to the concept of *New Museology*, the design of exhibition spaces should "assist visitors to pace themselves" (Wright 1989: 138) and also facilitate the alteration of pace so that visitors have the opportunity to reflect on, question and form an understanding of the displays. Audio guides in museums are often used for pace management purposes, so people who listen to the commentaries do not crowd in front of a display but move evenly around the exhibition. Specifically, in well attended 'blockbuster' exhibitions, the audio commentaries are designed to impose both a certain speed as well as direction to visitors, prompting them to move on along a route. Furthermore, advocates of technological innovation in the museum field also highlight the potential of the technology to support one's own pace, e.g. (Spalding 2002), mainly through personalisation of information.

The speed of the visit and the sequence one interacts with displays has been used to classify or categorise visitors (Levasseur and Véron 1983; Sparacino 2002). This informed the design of content and user interaction in electronic guidebooks,

e.g. (Marti 2001), as was already discussed in Chapter 2. Furthermore, research in wearable computers and digital tourist guides (Randell and Muller 2002) used accelerometers to infer one's activity from one's pace, for example whether the user is sitting, running etc., so as to make available appropriate information. However, the above mentioned approaches appear to focus on visitors as individuals. Although they associate pace with one's own engagement with the exhibition, they treat and discuss pace from a cognitive rather than a social perspective. Pace as it is developed and sustained in a group museum visit appears disregarded by research. However, as discussed in Chapter 5, one's engagement with displays is socially mediated and informed by one's companions' engagement. Therefore, the discussion about the social dimension of pace in group museum visits is not only relevant but essential in the study and understanding of the visiting activity among collocated and non-collocated visitors.

In group situations, pace is often associated with coordination. For example, in military parades, coordination is an important aspect of pace along with the size of pace and distance among participants. Similarly, in athletics *pace leaders* are employed to secure a stable and effective pace throughout the race for a whole group of runners. In these situations, sustaining a pace is a defining aspect of the activity and any failure to do so leads to the failure of the activity. A looser but essential connection between pace and coordination is also discussed in studies of tourists (Brown and Chalmers 2003), hunters (Harr 2002), and mobile game players (Flintham, Benford et al. 2003). However, these studies often focus on the role of coordination as a means towards a goal, for example to catch other players. They also look at instances in which coordination of pace becomes the primary 'task' of the activity that attracts and demands the attention of the individuals involved.

There are, however, many situations where production of pace in groups happens in the periphery of the main activity. In these cases, pace influences and shapes the experience of the overall group activity, but it does not become a task in its own right. This is a common part of everyday life when people walk with their friends on the street, go shopping together or visit an exhibition. Groups of people

often take part in sporting activities such as hill walking, cycling and horse riding, and clubs often organise 'social pace' events (e.g. (Capital Bicycle Club 2003)), i.e. excursions that are done in a relaxed manner "with plenty of opportunities to smell the roses, view the scenery, and stop at bakeries or other refreshment locations". These events are meant to appeal to a variety of members and offer the opportunity for socialising as well as exercising, with the promise that "nobody will be dropped or left alone".

6.2.1 Collaborative production of pace among collocated visitors

It is this notion of one's individual attention to one's own interests, and its relation to one's coordination with other people's interests within the scope of a shared activity, that are particularly relevant to the discussion of pace in casual group museum visiting. For in collaborative production of visiting pace, each member contributes to the overall direction and speed of the visit by negotiating engagement with the exhibition and with other members. Unlike pedestrians who "formulate those problems of direction, pace, destination etc., that can be potentially problematic for the anticipated enterprise" (Ryave and Schenkein 1974: 272), casual museum visitors—at least collocated ones—do not appear to do so beforehand. The negotiation of pace is an intrinsic, 'unremarkable' part of the overall visiting activity and to some extent, defines the leisure aspect of the museum experience. Gesture, posture and body orientation appear of significance for the collaborative production of pace. The following vignettes offer some interesting points of reference for this discussion.

Vignette 6.5

A couple (M and W) in their 40s visited the House for an Art Lover. They bought their ticket and took the leaflet, but they did not take the audio guide. We join the action as they stand in front of the bay window in the *Oval Room* and they discuss the view to the garden. The interaction shown in this vignette lasted approximately 20 seconds. It is worth noticing the role of gestures in the interaction.

The two visitors were discussing the view from the window in the Oval Room facing the window (6.5.1) and pointing at things in the garden. Gradually, the man

6.5.1

6.5.2

6.5.3

6.5.4

6.5.5

started turning towards the woman who was still pointing at things outside the window (6.5.2), up to a point where the man's position was perpendicular to that of the woman (6.5.3). In the meantime, the woman stopped pointing as she turned towards the man while passing her hand through her hair (6.5.3). At that point the man took the woman by her waist and slowly twisted her towards the other direction (6.5.4–5). The timing of the movement and its smooth, 'intimate' character was organised to fit with the transitional stage of the woman's engagement, i.e. in between finishing attending to an artefact and starting engaging with a new one. The movement also suggested possible reorientation towards unexplored artefacts in the adjacent side of the room. The design of the gesture, therefore, 'afforded' the woman's disengagement from her previous interest (the view of the garden) and re–engagement with a new one. This is indicated by the fact that she seamlessly started pointing at another object (6.5.6) within her new field of view, the fireplace, while both started walking towards the exit (6.5.7).

6.5.6

6.5.7

Vignette 6.6

A couple (M and W) in their 40s visiting the House for an Art Lover bought their tickets, and took the leaflets and the audio guides. We join them while they are in the *Music Room* and they are listening to the commentary regarding the fireplace wall. The interaction shown in the vignette lasted approximately 40 seconds. The woman's actions are of particular interest here.

6.6.1

6.6.2

6.6.3

6.6.4

6.6.5

6.6.6

6.6.7

The two visitors were in the music room facing the fireplace wall and listening to the related commentary (6.6.1) on their audio guides. A few seconds later the woman turned her back to the fireplace to face the other side of the room, and subsequently stopped her commentary (6.6.2). In the meantime the man kept listening to his audio guide. The woman took a few steps towards the man and she stopped in that position (for 10 seconds) looking around and adjusting her bag (6.6.3–5). After that, she started moving slowly towards the other side of the room (6.6.6). At that point the man started turning towards her. His turn was done in two stages. In the first stage he briefly stopped after a 90° turn (6.6.6) and then he continued turning round to an overall 180° (6.6.7), so as to face the opposite side of the room. During this movement, he kept listening to the commentary on the audio guide. He stopped the commentary after he had completed the turn and faced the opposite side of the room while the woman was already half way to the other side of the room. Eventually they both met in the other side of the room in front of the piano.

Subtle social gestures that communicate intentions, like the man's taking the woman's waist (vignette 6.5), or personal grooming gestures like the woman's flicking of hair (vignette 6.5) and the adjustment of the bag (vignette 6.6) are often present in the negotiation of pace among companions. Their production and recognition as indicative of stages of engagement and disengagement are essential to the collaborative production of pace. In vignette 6.5 the sequential development of the gesture, for example the trajectory of the man's turn, is produced and recognised by the woman as an indication of the man's disengagement of the exhibition and intention to move on. Furthermore, the pause of the woman's exploration of the view, as shown by the shift in her orientation (and the flicking of her hair), may be recognised as an indication of her temporary disengagement

of the exhibition and her attendance to the social relationship with her companion. The timing of the man's gesture, taking the woman's waist, opened up "an array of structurally differentiated possibilities" (Goffman 1981: 137) for the woman, for example: to keep looking at the view, to explore the adjacent seats, to adjust her view with her partner's view and so forth. Subsequently her implicit agreement with the man's intention to move on was necessary for the achievement of the collaborative move.

The production of a pause by the woman in vignette 6.6, combined with the shift in her orientation and the subsequent interruption of the audio commentary, were also essential for the management of the pace. The overall action was what one might call an 'accountable' action; effectively a movement produced by the woman to present her disengagement with the fireplace display. Furthermore, the organisation of the movement, i.e. the woman's change of orientation and her new position closer to her companion in combination with her subsequent preoccupation with her bag, was designed to be recognised as an indication of disengagement. The examination of the vignette shows that it was also recognised as such by the woman's companion. In the observations of collocated visits, museum visitors used 'gestural pauses' to indicate that they had finished with the exploration of one object and they were ready to move on. The pause was usually expressed in both time and space, as physical removal from the focus of previous engagement, for example a step backwards or shift in the orientation, and as a period of perceived disengagement in contrast to the preceding period of engagement.

How one presents oneself at different stages of (dis)engagement with an activity appears to be of great importance in collaborative pace production. In vignette 6.6 for instance, the woman's pause indicated an overall disengagement of her previous personal activity of attending to the fireplace, but only a 'light' disengagement of the shared activity of exploring the room together with her companion. In fact the prolonged pause that was filled with the activity of adjusting the bag operated as a request for her companion to move on. The expression of the request however took into account the state of engagement of her companion as it was recognised through his body orientation and interaction

with his audio guide. Furthermore, the man's timed body turn acknowledged the woman's request without causing the immediate disruption of his personal engagement. The changes of posture and orientation and the manipulation of objects operated as an economic way of communication (Heath and Luff 1991a) in the periphery of the main activity of engagement with a display. In this case, the production of shared pace was the result of implicit negotiation between the two visitors and a compromise among their individual engagements with the exhibition.

It is worth mentioning here that, as was discussed with regard the initiation of the visiting activity, objects and their manipulation play an important role in the management of pace too. For instance, Watts (2003) in his study of riots and marches described how the banner holders could manipulate the pace of a whole march, and disturb the flow with their own movements. In the case of the House for an Art Lover, the position of the audio guide close to one's ear or held on the side of one's body functions as an indication of one's engagement with a commentary or one's intention not to listen to it. And although the mere use of the audio guide does not necessarily indicates one's (dis)engagement with a display—since one might remain engaged with a display without listening to an audio commentary—in combination with other cues it may support companions' awareness of each other's stages of (dis)engagement. In a similar fashion, other objects, such as the audio guide index panels in the rooms of the House for an Art Lover, also supported the peripheral awareness of one's engagement. It was quite a common behaviour among the observed visitors that they referred back to the index panel every time they wanted to initiate a new commentary. This action (or lack of it) could then be used by one's companions to infer one's sustained interest in a specific room or, on the contrary, one's intention to move on to the next room.

This is not to say that use of objects and the interpretation of it in the management of pace are fixed and static. As previously pointed out in the case of the audio guide—this can also be argued for the use of the bag in vignette 6.6—the sense of the object is 'indexical' and it could not be "retrieved apart from the interactional context in which it [was] encountered" (Hindmarsh and Heath 2000: 557).

However, when the use of objects is examined within the local and situational context of an activity, it may become a valuable resource for pace management among co–visitors.

Furthermore, the management of pace among collocated visitors took advantage of visual awareness of one's own companions in association with the surrounding exhibition space. For example in vignette 6.6, when the woman started walking away from the man, the man turned and reengaged in visual contact with the woman's movement while he was still listening to the audio commentary. In the observations of collocated visitors, it was also common for visitors to stay in the same room, within visual range of their companions, or explicitly inform them that they were going to move on. The trajectory of one's movement in combination with the features of the environment, for example the man's orientation towards the fireplace in vignette 6.5, were resources for museum visitors to use in order to remain in the same pace or adjust their pace to fit the pace of their companions. These resources were constantly appropriated in the course of the activity to fit with the social and personal engagement of the co–visitors.

Pace was not always implicitly negotiated among collocated visitors. It was rather consciously and explicitly handled upon in cases of coordination, for example when a member of the group needed to leave the exhibition space and visit the toilets. The speed of the visit and the choices of objects to be seen were also influenced by other time arrangements, for example when the time of the visit was predefined as a result of a table reservation in the museum restaurant. The studies, however, showed that in casual collocated visits, the moment–to–moment production of shared collaborative pace happens in the periphery of the engagement with the exhibition displays. Body posture, orientation and gestural behaviour are produced and recognised by visitors as indicative of each other's engagement and disengagement and their intention to move on. Furthermore, visual awareness of one's own companions facilitates the preservation of a shared pace and the opportunities for collaborative engagement. Based on these cues, co–visitors adjust their own engagement so as to satisfy their own needs but also to keep up with the rest of the group. Furthermore, this implicit negotiation offers an

impression of fluidity during the activity which Hensel (1987) refers to as the "dance" part of the visit.

6.2.2 Collaborative production of pace among non-collocated visitors[21]

An initial concern with the lack of fluidity in the Mack Room mixed reality visit triggered further investigation into the management of pace in group visits. In that respect, the observations of non–collocated visitors informed the analytical treatment of the observations of collocated visitors, by making ordinary actions of the participants more apparent. This part of the investigation took advantage of the ethnomethodological concept of "breaching experiments", as it was presented in Chapter 4. Effectively, the disruption of the pacing practices through the introduction of the mixed reality environment supported the investigation and understanding of the practice as this was discussed in the previous section (section 6.1).

However, the notion of disruption should not be treated as a statement of the problematic management of pace in mixed reality museum visits. Distributed mediated practices that appear problematic when compared with corresponding face–to–face practices are not always problematic from the point of view of the distributed participants. As Dourish et al. (1996) reported from their study of an office share, "face–to–face communicative behaviour in the real world is not always an appropriate baseline for the evaluation of mediated communication". Furthermore, the *Mack Room mixed reality environment* was a novel approach to co–visiting that had not been attempted before in a museum, therefore the activity during the trials should rather be treated as a means to "make visible the contingent ways the technology is made to work and the interactional practices providing for and organizing that work" (Crabtree 2004a) rather than a straightforward evaluation of the activity and/or the individual practices. A few vignettes from the mixed reality environment will facilitate this discussion.

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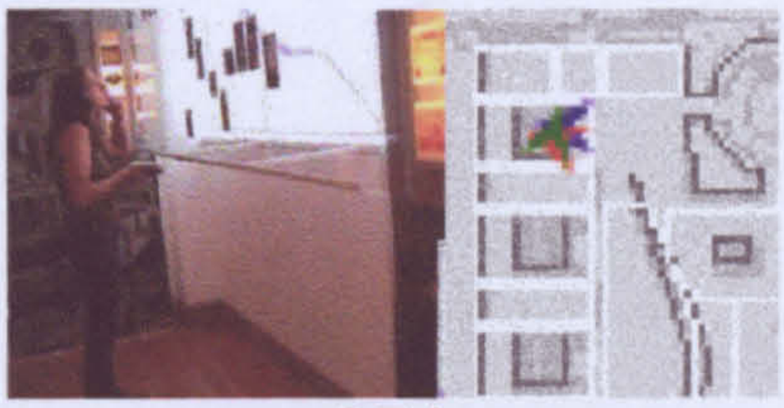
[21] As mentioned in the description of the user trials in the Lighthouse the experience had two fairly distinct parts: an exploration–based part and an activity–based part. The pace of the visit during the activity–based part was determined by the question–answer activity. The vignettes discussed in this section are taken from the exploration–based part of the visit.

Vignette 6.7

Three participants were looking at and discussing the exhibits around the *Glasgow School of Art* and the *Mackintosh's Glasgow* displays. We join the action as the local participant decides to move on. It is interesting to notice how her intention is communicated to the rest of the participants.

G: And there are numbers on the map that indicate the buildings *6.7.1



6.7.1

R: Okey doke

B: [Right

G: [I'll move from here (She turns to her left and walks towards the other side of the room looking around.) *6.7.2

6.7.2

R: (He jumps to the architecture and interiors area.) (7) Ok, let's, let's come down here

G: (She keeps walking glancing around.)

B: (He is moving towards the other side of the room—it appears like he is following Green.)

G: (3) Ah there is information about architecture and interiors (pointing at the panel) *6.7.3

6.7.3

B: Right I've got that

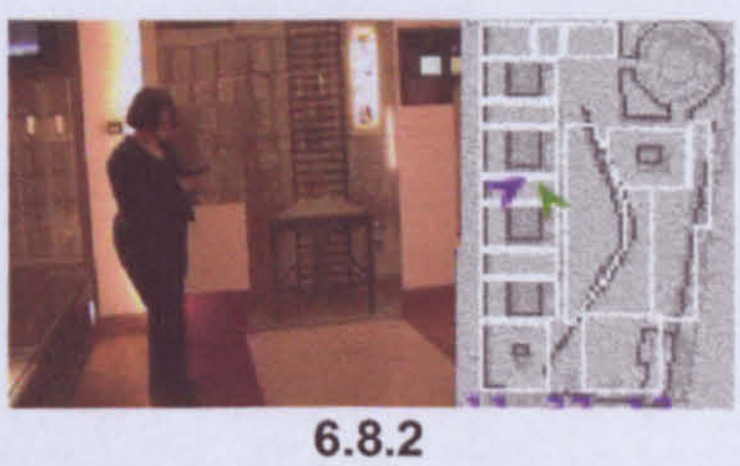
Vignette 6.8

Two participants were talking about the artefacts in the display case of the *Willow Tea Rooms* display. The local participant then turned to look at the panel and the touch screen about the Willow Tea Rooms. It is worth noticing how the two friends negotiate their next movement.

G: Are you looking at the *Willow Tea Rooms* itself or something else? (She looks at the *Willow Tea Rooms* display.) *6.8.1

6.8.1

B: No I am still in the *Furniture and Design* place at the moment yeah



6.8.2

G: Ok well I'll come back and look at the work in *Furniture and Design* (She turns and she walks towards the *Furniture and Design* display, briefly checking her handheld. *6.8.2) (1)

Erm (looking at the display)

B: Actually I'll come to the *Willow Tea Rooms*

G: (She turns and walks quickly towards the "Willow tea Rooms" display following the route she came from.) Ok I'll go to the *Willow Tea Rooms* as well then *6.8.3

6.8.3

B: (She turns and moves toward the Willow Tea Rooms area.) *6.8.4

G: (4) So here I mean really there's just that little (1) place that I described to you (She points at the panel with her free hand.) (.) and then just script which you probably have, the *Willow Tea Rooms were designed in 1903*

6.8.4

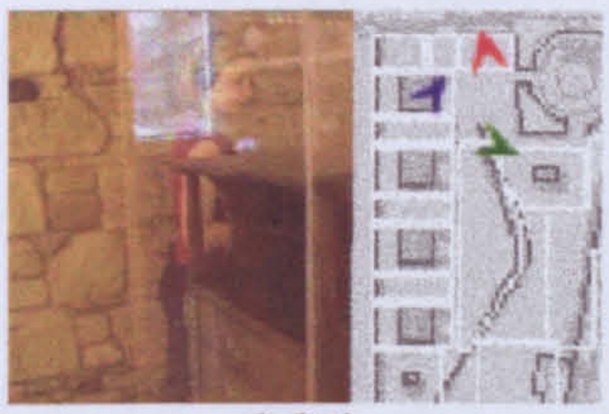
B: Aha

G: *for Kate Cranston* is that do you have that in front of you?

Vignette 6.9

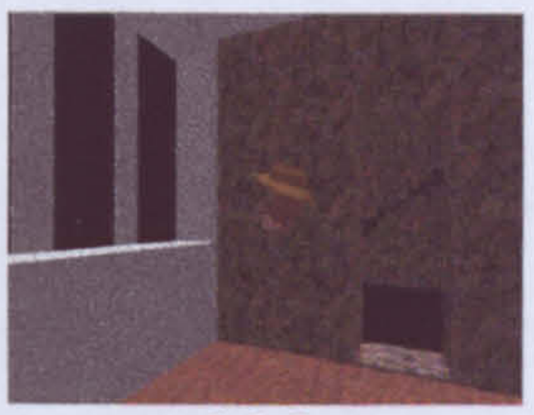
Green (local participant) was looking at an architectural model of the Lighthouse while Red (hypermedia participant) was looking at a historic photograph of Glasgow in the *Mackintosh's Glasgow* display. Blue (VE participant) was moving close to Red with no clear indication whether she was engaged with any of the displays.

G: [I can't see any sign (She circulates the exhibit case looking for a sign.) *6.9.1



6.9.1

B: [C'mon we are waiting for you *6.9.2



6.9.2

G: What?

B: C'mon we are waiting for you

G: Ha, you are waiting for me. Ehmmm (She stops and checks her handheld.) *6.9.3

R: Hmmm

G: Ok I am coming I don't know where (She walks around the case, turning her handheld to orientate herself.) *6.9.4

R: (He laughs) Are you coming in circles Carmen (Green)?

6.9.3

6.9.4

Vignette 6.10

The three participants were initially looking and discussing the exhibits in the *Reputation* display followed by silence and personal investigation of the content. In the meantime Blue (VE participant) moved to the *Reception* area. Green (local participant) checked his handheld, and he asked the VE participant her reason to move.

G: Jo (Blue) where (.) you've gone out to the Reception for some reason? *6.10.1
R: (She jumps to *Reception* area when she hears "reception") *6.10.2
B: I just haven't been here before
G: (He laughs)

6.10.1 6.10.2

Instances like the ones presented in vignettes 6.7-6.10 were common in the mixed reality visiting sessions. Participants often announced to the group their intention to depart from a specific display (vignette 6.7), companions followed their friends around (vignette 6.7), joined them at the spot they were reported on the map (vignette 6.10) and they did so silently or by verbally confirming their action. They also stopped their own engagement with a display to join their friends (vignette 6.9) or to socially negotiate and decide on the next point of interest (vignette 6.8). In all cases participants appeared to organise their pace so as to be close together and look at or interact with displays that could be accessed by all three (or at least by two of them—also reported in (Hindmarsh, Fraser et al. 1998)).

In mixed reality co–visiting, demonstrating engagement and disengagement with exhibits was also essential to the management of pace, as was discussed in the previous section with regard to collocated participants. In the mixed reality environment this was primarily done through verbal communication. Participants used verbal announcements to confirm their status of engagement with an exhibit. Discussion in section 6.1 suggested that pauses among collocated visitors were usually complemented with gestural and visual cues that facilitated the intelligibility of one's situation. In the mixed reality environment, however, the way pauses were indicated through one's unchangeable reported location and

silence in the audio channel were ambiguous in both their production and recognition—with reference to telephone conversations, Jaffe and Feldstein (1970: 42-43) described silent moments among interlocutors as "peaks of uncertainty" that can be difficult to sustain. Moreover, they could be interpreted either as engagement or disengagement indicators. They could also express one's attention to social relationships *per se*, for example in vignette 6.9 the pause of the remote visitors reportedly expressed their waiting for the local visitor to join them. Visitors dealt with this ambiguity by often reconfirming their status verbally and by giving snippets of information regarding their activity, for example in vignette 6.9 the local participant described her effort to find a sign about the architectural model. These snippets of information were not always designed with a recipient in mind; rather, they often had a rhetoric function, facilitating and supporting one's own progress of exploration. In some cases, however, they supported the awareness among visitors (vignette 6.7) but in other cases they were ignored (vignette 6.9).

Participants also verbally communicated their disengagement with a display and their intention to move on. As has been already mentioned, conventional gestural behaviour was not supported in the mixed reality environment. All participants, but foremost the on–site participants, appeared to be quite consistent in verbally reporting (Hindmarsh, Fraser et al. 1998) their intention to move from one exhibit to the next, despite the fact that this information was often available through location indications in the system. From a human–computer interaction perspective, the development of this behaviour may be treated as a "coping strategy" that was developed by participants when the pace of the channel they were provided with did not match the pace of the activity they wanted to perform (Dix 1992). The related utterance by the participants was mainly formulated to express one's intention to move instead of expressing one's disengagement with the previous activity. It was also combined with a shift in one's orientation or movement towards a direction that would be either specified (vignette 6.8: "Ok well I'll come back and look at the work in *Furniture and Design*", "Actually I'll come to the *Willow Tea Rooms*") or unspecified (vignette 6.7: "I'll move from here"). Furthermore, unpredicted departures from a collaborative exploration without previous verbal warning were questionable (6.10) and the 'ignorant'

companions were prompted to account for themselves (see also vignette 6.4).

Moreover, it was a very common observation in the mixed reality sessions, and apparent to all four vignettes presented here, that the verbal communication of one's intention to move on triggered immediate reaction from the rest (or at least one) of the participants (vignette 6.7), even when they were in the middle of exploring displays (vignettes 6.8, 6.9) themselves. The specification of one's destination was particularly helpful in these instances and it was complemented by system information regarding one's location. Shared points of reference in the form of titles of display areas were constantly used by the participant for that purpose. Furthermore, in the prospect of an imminent movement, local visitors were often observed checking their map on the handheld (vignettes 6.8, 6.9, 6.10) to confirm where their friends were.

Overall, the management of pace in the distributed visiting activity appeared to prioritise an exploration of the exhibition that was based on and defined by instances of collaboration and opportunistic exploration of displays. Therefore, pace management techniques were used to coordinate the participants' collaborative interactions around displays, rather than facilitate the balanced combination of personal and social engagement. This finding points to the changing character of the visiting activity when mediated by mixed reality technology.

It is also in keeping with findings regarding the initiation of the visit, which indicated that distributed participants appeared to prioritise the common experience with the displays over their personal engagement. It also offers a justification of the extensive use of verbal communication as a quick and effective way of coordinating activities. Although this reorganisation of the visiting activity was favoured among the participants and often progressed in an unproblematic manner from the point of view of the interaction, it raises questions as to whether visits managed in this fashion might be disruptive for the ecology of the exhibition environment. We will return to this issue in Chapters 7 and 8.

6.3 Discussion

This chapter looked at issues surrounding the collaborative management of group museum visits, in particular the initiation of the visiting activity and the development of collaborative pace. Drawing on vignettes from both studies of collocated and non-collocated visitors, it argued that the initiation of a group's engagement with an exhibition and the pace of the group during the visiting activity are essential aspects of the visit that are often overlooked by museological and technological literature. The discussion pointed out that the management of the visit is a situated activity, socially organised and negotiated among the members of the group as they encounter resources available in the environment, these being objects or other people, and also as they express personal intentions and knowledge.

Overall the visiting activity is not comprised of isolated moments of engagement around displays, as they were discussed in the previous chapter and as other studies have also prioritised so far. Rather, it is a sequential event during which visitors connect objects, media, and locations together into one coherent group activity. This process is both supported and managed through the initiation of the visit and the pace of the visit. The coherence of the activity is a result of collaborative effort and mutual contribution to and negotiation of 'what is going on now' and 'what it going to happen next'. This negotiation involves intricate balancing of personal engagement with the exhibition and social interaction with one's companions. It is also based on the production and recognition of cues that indicate stages of engagement. Furthermore, it usually happens in the background of the visiting activity and it is often a mundane event.

Among collocated visitors, the dynamic achievement and reshaping of the intersubjectivity of the situation is mainly, but not explicitly, supported through visual cues and gestural behaviour as well as manipulation of objects. On the other hand, non–collocated visitors tend to verbally describe their intentions and movements, even when these may be supported by technology–mediated visual cues.

Direct comparison between collocated and distributed activity, as described in sections 6.2.1–2, might create the impression that the distributed visit resembles more a fragmented exploration of an exhibition rather than a fluid co–visiting activity. It is important, however, to highlight that the mixed reality museum visit, according to the participants' opinion and behaviour, was more social than casual collocated visits. This claim is not only based on the increased amount of talk but also on the increased effort to share the activity on the part of the participants. In that respect, the increased need for coordination and explicit expression and confirmation of awareness should not only be seen as an act of compensation for system deficiencies but also as an indication of the focus of the activity. For the introduction of technology did not only change the mediation of the activity but also its overall context and character; the visit among non–collocated visitors appeared in both the participant's actions and comments more companion–focused than individual–focused, a change that is also reported by (Olson, Olson et al. 1992) in the use of distributed collaborative systems.

Although one might argue that the extensive sociality of the visit "could be due to pressure on group members to produce as much joint work as possible during the experiment" (Dourish and Bellotti 1992), this chapter explored a series of vignettes to establish that in both collocated and non–collocated visits the situation at hand—whatever that might be—is shaped, defined and sustained through social conduct. Therefore, further attention in the sociality of the management of group museum visits contribute towards the understanding of the overall activity.

7 | Challenging the 'order' of the museum environment

The two previous chapters looked at the museum co–visiting activity from the point of view of social interaction, and examined vignettes regarding both the role of social conduct in the engagement with artefacts and the management of the visit. However, the material from the fieldwork, from both settings and in particular from the mixed reality environment, made evident that co–visitors are also engaged in a wealth of social conduct, with each other and with other people present in the galleries, that does not initially appear directly related to the visiting activity and sometimes even contradicts with the norm of the environment.

The discussion in this chapter focuses on these aspects of the visit, with an aim to examine how co–visiting behaviour in a mixed reality museum setting "fits in" (Goffman 1966: 11) the participants' environment. In this process it develops an argument regarding the appropriation of the activity through social conduct. This chapter is mainly inspired by a few incidents of 'remarkable' behaviour with technology during the trial sessions and therefore it should not be treated as a comprehensive discussion or explanation of the phenomenon. It is, however, supported by findings in workplace studies and other CSCW research that have pointed out that the sociality of technology extends beyond social conduct that may happen within the technology (Bowers, O'Brien et al. 1996; Dourish, Adler et al. 1996). For the use of technology shapes and becomes shaped by the social order of the setting in which it is used (Harper and Hughes 1993). This chapter offers an initial exploration of the topic on the basis of the conducted fieldwork. Further research, however, would benefit an in–depth appreciation of the situation.

The chapter initially introduces the notion of 'rules' and 'order' in museum environments and the co–visiting activity. Drawing on examples from the study of collocated visits, this chapter points out that the implicit and explicit rules of an environment are resources that participants may take into account in their interactions in the course of an activity inside the environment. In that respect, rules of an environment, alongside other elements, may inform the situated and ongoingly constituted order of the activity. Subsequently, this discussion forms

the background for the exploration of vignettes from the trial sessions with the mixed reality environment. Although the vignettes from the trial sessions included in this chapter are biased towards the local visitor, due to the nature of the user trials, the overall discussion may contribute towards the exploration of wider issues about the use of technology and the environment they are applied in.

7.1 The 'order' of the museum visit

Traditional museum galleries are physically structured spaces. Their physical structure is achieved and manipulated through a series of techniques, for example architectural elements, colour coding of areas, labels etc. The physical arrangement of the museum is also often associated with specific social behaviours, for example drinking and eating are more likely to happen in the restaurant areas; reading labels and looking at artefacts usually happen in the exhibition areas, and so forth. Furthermore, the activity of museum visiting is often associated with 'rules' of social behaviour, often referred to as "museum etiquette". Being a set of guidelines that aim to encourage and support a desirable visiting order for the benefit of collections and visitors. Nowadays, museum etiquette is often loosely defined as respect to the needs of other visitors, and is associated with the wider notion of appropriate behaviour in public places[22]. In some cases, the rules of visiting, with regard to collections, are more explicitly stated through leaflets, signs and labels around the exhibition area.

Some of these rules are concerned with the safety of the artefacts, for example eating and drinking, taking photographs, touching objects and running are some of the activities that are usually formally discouraged in exhibition spaces as they may be hazardous for the exhibition and for other visitors. On the other hand, the volume of one's voice during conversation in an exhibition, one's body positioning with regard to the artefacts and other visitors and so forth, are much more loosely defined and often dependent on the character of the exhibition. However, one might argue that the observable practice of expected visiting

[22] Museum etiquette as an officially defined set of rules appears to be particularly prominent in North American museums that tend to include etiquette guidelines for the potential visitors on the their web sites. Those web pages are mainly addressed to organisers of school visits or other type group visits. This may indicate that etiquette issues are expected to arise with groups more often than individual visitors.

behaviours, with regard to both the explicit rules of the setting and the related social etiquette, contributes towards the maintenance of the visiting order in an exhibition and is often responsible for the characterisation of the atmosphere of a museum as being old fashioned, i.e. tomb–like, or progressive, relaxed and so forth.

Furthermore, the norms of museum visiting are embodied, and therefore observable, in visitors' interactions, and often become apparent in instances of ambiguity. For example, in several cases during the observation study in the House for an Art Lover, visitors were observed to be uncertain as to whether the objects could be handled or not; in other cases visitors lowered their voice when other visitors entered the same room. Additionally, museum rules are also embodied in the actions of the attendants in exhibitions, who in many cases are trained to recognise and often deal with 'inappropriate' behaviours in the exhibition (AMOL-Australian Museums & Galleries Online). It would be therefore safe to suggest that the application of a setting's rules and etiquette by both visitors and museum staff involves accountable actions (Garfinkel 1967), in that they are produced and recognised as actions that are in line with the suggested order of the setting and they are recognised as such by the participants in the local milieu. However, this process is not as straightforward as it might appear.

Instead, the rules and etiquette of a museum setting should not be considered as strictly objective elements that are unfailingly applied in all circumstances. Neither should they be treated as objective and abstract descriptors of an activity. This chapter argues that a museum's implicit and explicit rules are rather resources for action and their application cannot be viewed separately from the socially accomplished practices that make up an activity. Therefore the accountability that derives from the application of the rules can only be judged against the "witnessably exhibited order" (Livingston 1987: 14) that is socially and reflexively produced by the situated application of the rules at any given moment. For instance, museum rules are regularly overridden by the museum itself through its organised activities. Functions, seminars, meetings and so forth often take place in exhibition spaces. In those situations, social behaviours such as loud talking, eating and drinking, speaking on the phone etc., which otherwise

might contradict the traditional museum order, are in total accordance with the situation at hand, i.e. the specific function—however, they are not always unproblematic (Hencke 1999).

Additionally, the order of the museum visit is constantly negotiated and achieved in and through the social conduct of the people who participate in the setting, e.g. visitors, museum staff and so forth. A few examples from the observational studies of collocated visitors will facilitate this discussion.

Vignette 7.1

A group of four people in their 60s visited the House for an Art Lover. As they told me later, M1 and W1 were Glaswegians and they were showing their friends, M2 and W2, around the House. They said that they were regular visitors, and they had been in the House for an Art Lover at least three times in the past. The excerpt begins when the four visitors started exploring the *Music Room*. It is worth noticing here the incident with the camera.

All four of them were moving around the room slowly. M2 was listening to the audio guide and he didn't mingle with the rest. W1 was examining details on the textile window panels. M1 was standing in the middle of the room and he was listening to the audio guide. He was also exchanging comments with W2 who was standing next to him and she was looking at the leaflets. I was standing next to the piano and took my camera out to take a picture of the room. M1 saw me and asked the rest of the group to move to the side saying "Let the young lady to take a picture". The rest of the people moved to the side. I thanked them and I said that it was not necessary. M1 approached me and asked me about the camera. He pointed out that it was extremely small and it didn't look like a camera. He asked me what type it was. I replied that it was a digital one and that it was a "Canon". He said that he found it useful to get informed about what was available in the market. Then he asked me whether I was a student in the School of Art, and he explained to me that his daughter was a student and they had been around several places to take pictures for her assignments. He also added that if I wanted to take a picture to let them know so

they would move to the side. Meanwhile, the rest of the group was listening to their audio guides.

Vignette 7.2

A couple (M and W) in their mid 20s visited the House for an Art Lover. After they had spent approximately 10 minutes in the interpretation area, they went to the *Oval Room*. During their exploration of the room they also engaged in unexpected activities, such as eating sweets. The excerpt starts when they started exploring the *Oval Room*:

Then they went into the Oval Room. They were the only visitors in the room apart from me. W keyed no. 21 on the audio guide [this is the number of the commentary associated with the room] and she walked to the interpretive panel next to the door and looked at it while she was listening to the commentary. M also keyed the number on his audio guide and went next to W. They read the panel without discussing. W walked to the other side of the room and sat on the left window seat. M sat on the right window seat. While W was listening to the audio commentary, she started searching inside her bag. She took out a bag with sweets (pic'n'mix). She rested the bag on her knees, she took a sweet out and she immediately offered the bag to M. He got a sweet too. When W's commentary finished she put the audio guide on the window sill and remained sat (as if waiting for M to finish too). When M finished with the audio guide, they started talking and W took out her camera and took a photo of M sitting.

In the two vignettes the group of visitors explored the room they were visiting through engaging with the features of the room and the interpretive material. However, their engagement with the room and their co–visitors may also reveal their approach to the visit and their interpretation of the exhibition environment overall.

In vignette 7.1, the four visitors were engaged with the exhibition. Additionally M1, at least, was aware of what other visitors were doing in the gallery, including me getting ready to take a picture. In that instant, my movement of lifting the

camera was perceived by M1 as my indication that I was about to take a picture and, since he was currently in the field of view, he moved away and prompted the rest of his group to do the same. The rest of the group also moved away.

The use of the camera in the specific incident is what one would call an accountable move and it is produced, but foremost recognised, as one's intention to take a picture of a person, object and so forth that might be within the field of view of the camera's lenses. Furthermore, the group's reaction to one's action with a camera and the unproblematic negotiation of their movement outside the camera's field of view indicates that taking pictures in a gallery is an expected ordinary action in this setting. Moreover, it suggests that the group in the vignette is in a position to infer that the target of the camera action is not themselves. Additionally, being in the field of view potentially obstructs one's effort to take a picture. Local resources such as the posture and orientation of the photographer, whether the photographer has company or is on his/her own, and also previous knowledge and experience of taking photographs in an exhibition space were all relevant to M1's judgment of the situation and informed his action, as well as his companions' actions. The whole group appeared to recognise and treat M1 suggestion, to move to the side, as an ordinary aspect of the setting and the activity.

This is not to say that moving out of the way when one is about to take a picture in a gallery is an inescapable rule. In many cases, when people visit exhibitions in groups, they urge their friends to move inside the camera's field of view, and stand in front of artefacts and buildings as to have their picture taken in the specific setting. This is also the case with singletons who may ask strangers to take photographs of them in front of artefacts. However, standing in the way while one attempts to take a photograph, in a setting that is broadly associated with taking pictures of artefacts without strangers obtruding one's view, may be considered an accountable action. In several cases in crowded galleries, visitors are forced to explicitly negotiate such situations by asking people to move out of the way, or by adopting a visibly waiting posture until people clear the space and so forth. Facilitating a co–visitor's effort to take a photograph of an artefact is a way of practicing the 'rule of respecting others' in the gallery and maintaining the

visiting order. The application of the rule, however, produces and also is produced in and through social conduct and according to the local resources and contingencies.

The socially achieved negotiation of rules is evident in vignette 7.2, which additionally indicates the flexibility of accountability in a museum setting. In that incident, the two visitors engaged with the environment and the material of the *Oval Room* by sitting in the window seats, listening to their audio guides, chatting and sharing sweets. Although this use of the room is very close to the initial intentions of the architect, since the *Oval Room* was intended as a drawing room for ladies to retire to after dinner, it challenges the current use of the room as an exhibition space, where eating is not allowed. However, the rule of "no eating" is not formally expressed in the exhibition area. There are no signs in the rooms and no attendants to remind the visitors. In contrast, in other Mackintosh attractions in Glasgow, attendants are at hand to remind visitors not to touch the furniture and to generally monitor the order of the setting. Respectively, there are no indications in the House for an Art Lover exhibition space that eating might be permitted or tolerated; for example there are no rubbish bins in any of the indoor or outdoor spaces of the House, apart from the designated eating areas; additionally, it is generally the case that nobody else is eating.

Although the couple appears to have breached the rule of the exhibition setting—and continuous breaching of the rule might render the rule redundant or force the museum to take action for the reinforcement of the rule—the action of eating sweets in the gallery does not appear to disturb the current order of the visiting activity in the setting. The informality of the setting, the relaxed atmosphere, and the lack of other visitors or attendants in the proximity are local resources that inform the couple's action. For instance, the woman of the couple was observed to put the bag of sweets back in her bag when the couple moved to the more crowded *Music Room*. Whether the timing of her action was coincidental or indeed influenced by the contingencies of the new setting (the *Music Room*) is difficult to determine with the fieldwork at hand. However, this kind of observation, alongside other incidents, such as lowering one's voice when in the presence of other visitors, indicate that visitors become more aware of a setting's

visiting order as they negotiate it with co–present others. Eating sweets in the *Oval Room* appears acceptable among the members of the group since none of the two expressed any hesitation in doing so. It is also in keeping with other leisure activities, where sharing sweets, chatting and taking photographs might be welcome and encouraged, e.g. in sightseeing or in the fair.

It is evident that the implicit and explicit rules of an activity or an environment are not external factors that determine the actions and interactions of the participants. Instead they are resources that furnish those who participate in the activity with ways of seeing and recognising things and practices as relevant features of the activity (Harper and Hughes 1993). As resources, therefore, they are essential for the accomplishment of the activity. The order of the activity, however, is a result of social negotiation among the participants and not a mere application (or disregard) of rules. For instance, Laurier et al. (2001) in a study of a neighbourhood café showed that the local rule of "queue–first, seat–second" was often overridden by the customers, and explicated how the appropriation of the rule was made to fit with the environment of the café, and therefore did not become sanctioned. For example, customers would wait seated in an empty table while their friends would queue in the till. Similarly, in an exhibition setting, some behaviours may appear in conflict with the expected norm but do not necessarily inflict a breakdown in the visiting order. Consequently, accountabilities that might arise with regard to the application of rules also appear flexible and situated, hence open to on–going interpretation in and through social conduct.

7.2 Remarkable behaviour in the mixed reality museum environment

From the discussion so far, it is evident that museum spaces and activities come with implicit and explicit rules and expectations of social etiquette, the situated application of which, informs the socially and reflexively constituted order of the environment/activity. Existing research in the use of technology in museums suggests that introduction of technology in these settings may alter the way people engage with the expected norms of the museum setting and consequently the accountabilities involved. For instance, vom Lehn et al. (2003) suggested that the

use of electronic guidebooks in exhibitions increases the dwell time in front of displays at the expense of other visitors' potential engagement with the same display. It also introduces unexpected navigation in the galleries that may prove disturbing for other visitors.

The following vignettes from the trial sessions also suggest that social engagement over the mixed reality environment in the Mack Room may have created a tension in the handling of responsibility towards the order of the setting and the order of social interaction among friends. The selection of vignettes in this section comes both from the exploratory phase of the trials and the question–based part. This is not to imply that the context of the two parts of the trial is identical. It is understood that participants during the question–based part were also exposed to another set of rules and expectations, beyond the rules of social interaction with friends and the museum etiquette: those of playing a 'question and answer game'. This sometimes had an obvious effect on participants' behaviour, who occasionally appeared determined to get to the answer regardless the people around them. However, an excerpt (vignette 7.5) from the question–based part is also included in this section. This choice was taken on the basis of the excerpt's relevance to the present discussion. Furthermore, the overall appreciation of the data suggested that question and answer situations may also occur in less structured visiting activities.

As before, in the following vignettes Green (G) is the on–site participant, Red (R) is the hypermedia participant and Blue (B) is the VE participant. Square brackets ([) indicate overlapping talk; *italics* indicate text borrowed from the museum labels; numbers in brackets indicate pauses measured in seconds (a single full stop in brackets indicates pause less than 1"); a star (*) indicates the position of images in the overall action.

Vignette 7.3

The three participants were exploring the top corner of the Mack Room, where the entrance to the *Tower* is located. The tower area was off–limits for the remote participants, since the VE participant could not access that area in the 3D model and there was no information in the system associated with it. The excerpt starts when Red (hypermedia participant) asked Green (local participant) what she could see in front of her. The main point of interest here is the exchange of greetings among participants:

R: Carmen (Green) ehm what can you see in front of you now? Carmen? *7.3.1

G: [Just three windows nothing else (She points at the wall with three fingers and she immediately after checks her handheld). *7.3.2


7.3.1


7.3.2

B: [(Inaudible)

R: Yeah yeah ok

G: Yeah yeah (.) Sylvia (Blue) you are behind me hi (She laughs loudly while she turns back and waves repeatedly in the air.) *7.3.3


7.3.3

B: Ciao

G: Mark (inaudible)

B: (Inaudible) What happened (inaudible) you disappeared

G: You know this staircase is really cool (.) going around (She makes a circle in the air with her left hand.)

Vignette 7.4

This excerpt is from the end of the trial sessions. The three participants had finished the question–based activity and were wandering around the room chatting. At that point one of the remote participants (Red) suggested a race.

R: Ok let's have a race (He jumps ahead of Blue.) *7.4.1

G: (Inaudible) (laughing)

B: (He laughs) [C'mon c'mon c'mon *7.4.2

G: [(He keeps laughing, checks his device and turns towards the centre of the gallery.)


7.4.1


7.4.2

R: (Inaudible) ok? (inaudible)

G: I am not I can't run with all this equipment (While walking to where his friends were reported on the map.) *7.4.3


7.4.3

B: Go on c'mon

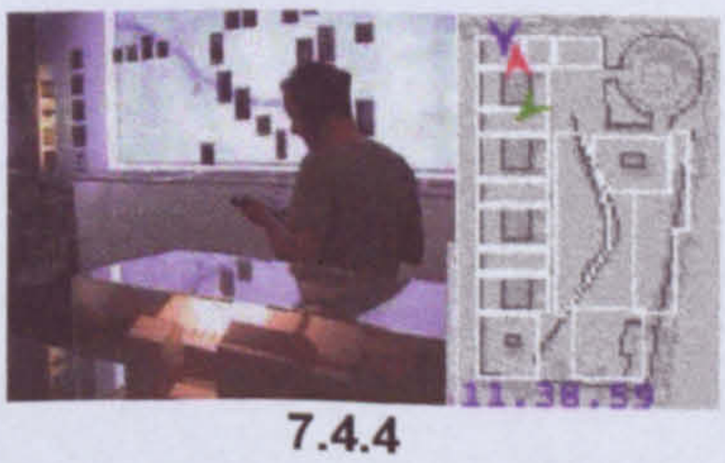
G: (He laughs, looks at the handheld and walks to the corner of the room.)

B: (Inaudible) (He turns to face the corridor.)

G: (He laughs)

G: Ok where are [you? Here *7.4.4

R: [Ok


7.4.4

G: (He laughs)

R: Top left corner

G: Ok (.) go (He starts running) *7.4.5

7.4.5

R: Whoever [(.) goes where?

G: [(He slows down and looks at handheld.)

B: Just the other side of the room

G: Are we not running? We are not (He keeps walking towards the other side of the room.)

7.4.6

B: [Steve (Green) get to the wall *7.4.6

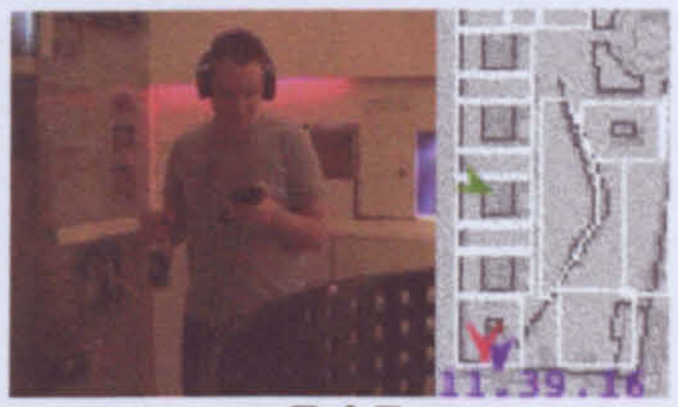
R: [(Blue and Red are aligned to the back wall line) Three two one go

R: (He jumps to the other side of the room) I am there I am there

G: (He keeps walking toward the other side of the room constantly monitoring his handheld.) No way how did how did you get there already?

R: (Inaudible)

G: See I am at the bottom of the room right now even my wee green blob (.) is moving very very slowly (looking at the handheld) *7.4.7



7.4.7

B: Your wee green blob

R: Yeah

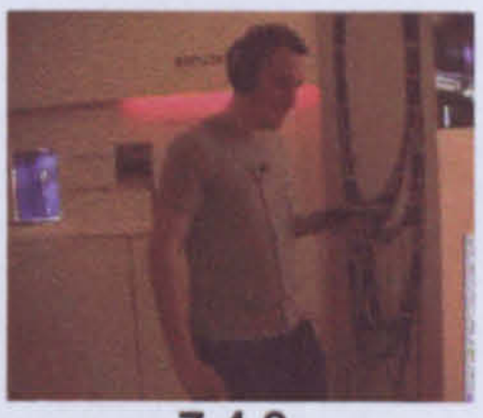
B: (.) Is that a metaphor for something?

G: [(He laughs)

R: [(He laughs)

B: Is there something wanna tell us? Dear oh dear

G: (He starts moving towards the center of the room and he briefly glances at the display about Mackintosh reputation laughing.) *7.4.8



7.4.8

B: Ahhh (sighing)

In vignettes 7.3 and 7.4 the three participants were interacting with each other while some of them also explored the environment and the displays. In vignettes 7.3, the three participants met up in the top right of the corner of the room where the display on *Mackintosh's Glasgow* was located. The local participant was also able to enter The Lighthouse tower from that point, while the remote participants could not access any information about it. This design feature of the environment was based on both the limitations of the tracking system and the limited information available about this specific spot. While the local participant was

giving information about the inside of the *Tower*, she became aware that her companions were behind her by checking on her handheld. At that point she rotated on the spot and she started greeting her remote friend who also returned the greeting. When she finished with the greeting she immediately resumed the unfinished exchange of comments about the staircase.

Similarly, in vignette 7.4, the three participants had finished the question–based part of the trial and were wandering around looking occasionally at displays and chatting. At that point the hypermedia participant (Red) suggested a race, which was accepted with enthusiasm by the VE participant (Blue) and initial disbelief by the local participant (Green), who, however, checked his handheld and started moving in the direction of his friends. It is worth noting here that the remote participants also moved to position while the negotiation about the race was happening. In that case the hypermedia participant showed the way to the rest of the participants by moving his icon. The moment the local participant got to the designated corner, he started running while the remote participants were trying to align themselves and start together. In the race, the remote participant used the technology in an unexpected way and jumped to the end of the agreed 'race course' ("the corridor") causing the astonishment and the laughter of his companions. As soon as the race had finished, the local participant started looking at the displays in his proximity. This was in total contrast with his behaviour during the race, during which he constantly looked at his handheld.

What stands out as remarkable behaviour in these two vignettes is that the local participants are engaged in actions that challenge the social order of the musuem environment and, in the case of vignette 7.4, directly contradict with the expected museum visiting behaviour, since racing in the Mack Room is an activity that is neither encouraged nor catered for within the setting. On the other hand, it is not formally forbidden either. Nevertheless, the spatial arrangement of the gallery creates a long open corridor on the far side of the room, which the participants used as a race course in that particular instance. Although one might dismiss the incident in vignette 7.4 as an exaggerated, one–off event, the vivid type of greeting produced by the local visitor towards her remote friends in vignette 7.3 occurred regularly throughout that trial session and to a lesser extent in other

sessions too.

The actions of the local participants and the overall racing event do not appear to fit with expected visiting behaviour. For instance, visitors are not expected to wave intensely in the air unless it is maybe required for the operation of an interactive display, and a bystander in the gallery would probably perceive them as awkward or inappropriate. Similar behaviours have been reported before in the use of mobile phones and in mixed reality performances. For instance, as was mentioned in Chapter 2, in their study of a mixed reality poetry performance, Benford et al. (2000) reported that the remote participants tended to ignore the poet who was performing and often occupied the 'virtual stage' with their avatars. Those incidents were attributed to the limited feedback in between the local and remote environments, and the technical incapability of the poet to address remote participants and maybe attract their attention or challenge their indifference to the performance. What was, however, perceived as inappropriate behaviour in comparison to expected behaviour in poetry performances, was in accordence with the broader use of collaborative virtual environments for chatting and joking with other online participants.

In that respect, the actions of local participants in the above vignettes may be perceived as 'remarkable' when seen from a museologically trained point of view or with respect to the appearance of the visitors in the gallery, but they do not appear equally awkward when seen from a perspective that focuses on social interaction with friends—in the case of vignette 7.4, the three friends might have also had common experiences of networked collaborative games that would also have a bearing in their actions. For example, in vignette 7.3, the local visitor acknowledged the presence of her friends in the area and in vignette 7.4, the local participant responded to his friends' invitation and pressure to take part in a game of racing. Nevertheless, these interactions were enabled by the mixed reality technology, since location information helped participants to remain aware of their friends' position in the gallery and the spatial representation of the gallery offered them the opportunity to treat the gallery environment in different, often contradicting ways, such as a visiting setting or a racing setting. Their actions, however, were responses and evidence of their participation in the social

relationship with their friends. Hence, if the local participants in the above vignettes had decided not to respond to their friends they would be held accountable for ignoring them.

From what has been said so far, it emerges that the local participants were caught in the tension of handling multiple accountabilities, which may also conflict with each other: namely, to attend to the rules of social respect traditionally expected in the gallery environment and to also present oneself as responsive friend. The issue of conflicting or overlaid accountabilities and the tension they might cause to the parties involved has also been discussed before with regard to the use of technology. Randell (2004a) described the tension that arises with regard to nurses' accountabilities when an alarm goes off in the intensive care unit without being immediately silenced; the conflict arises in presenting oneself as a nurse and competent user of technology among other nurses, and also as a nurse competent in limiting the disturbance for the patient and his/her relatives. Furthermore, with regard the use of mobile phones in public places, Murtagh (2002) suggested that an unanswered mobile phone is morally accountable to the caller whereas an answered mobile phone is also accountable to the people present in the situation. Ling (1997), alternatively used Goffman's (1969) "front stage and back stage approach" to suggest that the use of mobile phone in the public is similar to being in two front stages, which is a situation that cannot be sustained. Therefore the user of the phone is often awarded a back stage status regarding the interrupted activity until the call is over.

Going back to the specific vignettes discussed in this chapter, it becomes obvious that when conflicting accountabilities arise in a relaxed and flexible situation like museum visiting, it is more likely that a temporary suspension of visitors' accountability with regard to the social rules of museum visiting may occur—which was also the case in vignette 7.2 when the two visitors shared sweets in the gallery. This is not however, to say that the handling of the tension will always be unsuccessful or indeed problematic. The following vignette will help us explore this topic further.

Vignette 7.5

The three participants were trying to find an answer to the question "What Mackintosh's building is on Parson Street and what is its use right now?". This question was on the local participant's card of questions. The answer could be located on the *Mackintosh Guide* display. The excerpt starts when Green (local participant) locates the image with a description of the building. It is interesting to also note the activity of another co–present visitor in relation to what Green discusses with his remote friends.

G: Yeah it's the (.) *Martyr's Public School*

Visitor: (He glances at Green's card and handheld.) *7.5.1

7.5.1

B: Aharright ok

G: [(He points towards the display with his card.) And it's

Visitor: [(He takes a leaflet from underneath the Martyr's School image) *7.5.2

G: [(3) now *open to the public* (.) public (He leans forwards while reading.) *7.5.3

Visitor: [(He is looking at the leaflet.) *7.5.3

7.5.2

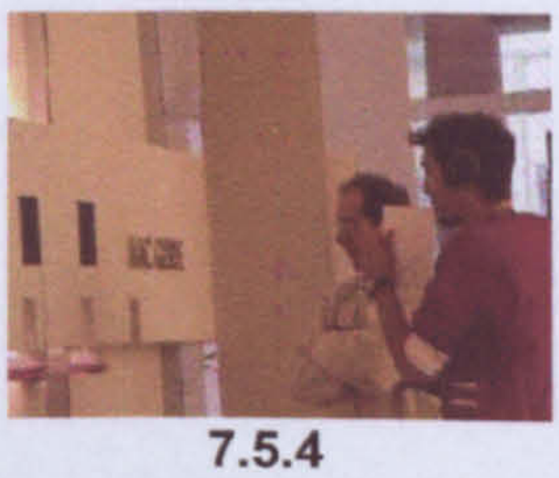
7.5.3

B: What was the question heh?

G: It basically was *what Mackintosh building is in Parson Street* and

R: Ah allright

Visitor: [(He stops readings and he is looking at the display) *7.5.4



7.5.4

G: [*is in use right now* and it's basically ehh ehh it's taken *by Glasgow Museums* *7.5.4

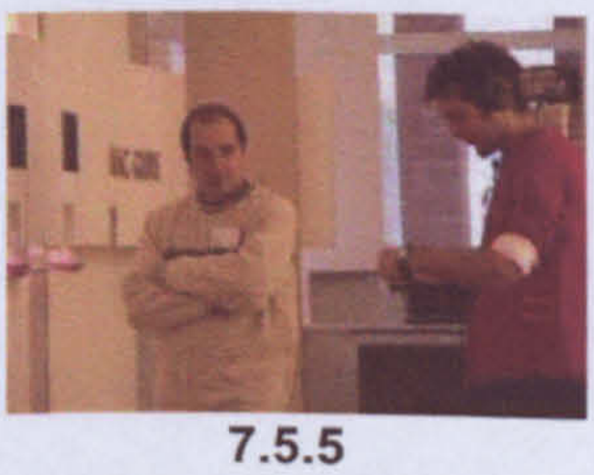
R: Right

G: and (.) its *cultural and leisure services.*

B: Cool yeahh I've got it

G: (He takes half a step back and he checks his question card). Open to the public.

Visitor: (He takes a good look at Green and he starts moving in between Green and the display) *7.5.5



7.5.5

G: (1) Ok?

R: Yeap

B: Yeah

G: [We all get it?

Visitor: [(He turns and stands towards the display) *7.5.6

7.5.6

R: Yeap

B: Ahm

In vignette 7.5 the three participants were involved in answering the questions about the life and work of Mackintosh. In the particular instance the local participant had just located the answer to the question in a display that happened to be examined by another visitor at that time. The visitor became aware of the local participant, as shown by his initial glance (image 7.5.1), when he heard him talking. While the participants in the trial were trying to establish a common alignment to the display, the visitor stayed in the proximity of the local participant looking at the display, reading a leaflet he picked up and occasionally glancing at the local participant. He finally crossed over to the other side of the local participant by walking in between the local participant and the display, after the local participant had finished his engagement with the display and had taken a step back. During the course of the overall interaction the local participant did not appear to acknowledge the visitor.

As has been already discussed in the exploration of the previous vignettes, the local participant in the above vignette also appeared to challenge the expected visiting behaviour in the gallery by positioning himself very close to a fellow visitor and by talking loudly to his remote friends. The disturbance in the order of the visit was recognised by the fellow visitor, as shown by his initial glance (7.5.1), who attempted to restore the order by awarding to the 'indiscreet visitor' what Goffman (1966) called "civil inattention". Through his initial glance to the local participant and his consequent withdrawal of attention from him, the co–present visitor indicated that the 'indiscreet visitor' did not "constitute a target of special curiosity or design" (ibid.: 84). Furthermore, his reluctance to cross over to the other side of the display while the local participant was obviously reading from and talking about it, indicates that he recognised the activity of the 'indiscreet visitor' as one of engagement with museum artefacts and therefore respectable, if the order of the visiting activity was to be maintained. The notion of civil inattention is often discussed in current CSCW literature with regard the use of technologies, e.g. mobile phones, in public.

It is now clearer that the order of a museum setting or a visiting activity is both flexible and socially negotiable. Accordingly, accountabilities that may be associated with rules and social etiquette are also open to interpretation on the basis of local resources and contingencies. For example, in the incidents with the animated greeting and the race (vignettes 7.3 and 7.4), the exhibition space was relatively empty. Therefore the chance of disturbing other visitors was very limited. In that respect, the accountability of local participants towards other co–present visitors was also unlikely to be questioned or scrutinised[23]. Furthermore, in the last vignette (7.5), the attention to the social interaction among trial participants, which was required in answering a quiz question, legitimised the local visitor's conduct with regard to other visitors and the use of the gallery space. Furthermore, it should not be forgotten that the technology used in the *Mack Room mixed reality environment* was novel for both participants and bystanders.

It is, however important to point out that the flexible negotiation and application of the rules of museum visiting by the participants was not also accompanied with the display of "rules of use" of the technology in the museum setting. Murtagh (2002) in his analysis of social conduct between mobile telephone users and other travelers in train carriages indicated that subtle changes in the mobile phone user's gaze and posture were often deployed to deal with the use of the phone in a public place. The set of these gestures may then display the "rules of use" of this novel technology within the everyday activities of people. In the vignettes from the Mack Room trials, however, no such behaviours were observed on behalf of the local participants. For example, in vignette 7.5, while the co–present visitor appeared to acknowledge the local participant, the local participant did not appear to do the same at any stage of the interaction. Furthermore, the local participant in vignette 7.4 focused exclusively on his handheld screen during the preparation and the development of the race, without acknowledging the environment around him but only after the completion of the race.

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[23] It is worth noting here that in a 'real life' deployment of technology similar to the *Mack Room mixed reality environment* a set of accountabilities will also arise with regard to remote participants and their local settings and activities. The quasi–experimental setting of this investigation could not support the detailed understanding of this aspect of the activity. It made evident, however, the need for further research towards that direction.

Moreover, this was not a result of ignorance of the social norms of museum visiting on behalf of the trial participants. It is important to remind the reader that the participants were self–declared museum goers. Furthermore, in the debriefing interviews, when they were asked about their conduct in relation to other people in the gallery, the majority of them replied that they did not feel intimidated or uncomfortable at the time of the trials but they indicated that they would feel uncomfortable if they knew that other visitors had paid money to see the exhibition, they had traveled from afar or the gallery space was crowded. This last issue raises the question whether short term trial sessions can be proved sufficient enough to demonstrate what Bowers call "the *totality* of activities involved in attaining awareness of others and of displaying one's own activities to them" (1996: 388). It also hints that longitudinal studies of the technology may contribute further in the understanding of how people handle overlaid accountabilities introduced or enabled by technology, and how rules of engagement may change as a result of it. The circumstances, however, of this fieldwork as part of a bigger, fast evolving interdisciplinary project did not permit the conduct of longer studies of the specific setting.

7.3 Conclusion

This chapter offered an explorative investigation of the use of mixed reality technology in museum settings with regard to the use of technology and the order of the environment that it is introduced into. The investigation was triggered and carried forward by a series of 'remarkable' behaviours that were observed during the trial sessions with the *Mack Room mixed reality environment.* In keeping with the loose notion of breaching experiments, which underlies the approach to the analysis of data in this thesis, events from the distributed visiting activity stimulated the investigation of collocated visits with regard to the order of museum visiting and the ways conduct is produced and recognised as an accountable practice of maintaining and continually reshaping this order.

Social behaviours associated with museum visiting, often referred to as museum etiquette, and the rules of a setting were discussed and their role as a resource for

accomplishing the activity of visiting was emphasised. The introduction of technology, such as ubiquitous mobile mixed reality technology examined in this research, unquestionably enables new ways of taking advantage and also challenging this resource, as was demonstrated in vignettes from the trial sessions. The technology appeared to facilitate the co–existence of overlaid social contexts in the course of a single activity which may also lead to overlaid conflicting accountabilities with regard to actors' actions within a setting. The handling of the tension that arises from conflicting accountabilities is subject to the participants' judgement and appreciation of the situation based on local resources. This finding is in keeping with relevant research in the use of mobile phones in public and other settings. Additionally, it suggests that the study of technological application in museum settings might particularly benefit from an approach based on the notion of social accountability. This understanding may inform the design and evaluation of technologies with respect to their 'suitability' for and their impact on the order of the visiting activity.

This chapter also hinted that, in social leisure occasions such as museum visiting, the responsibility of co–visitors towards the maintenance of their personal relationships may be prioritised over the maintenance of the visiting order. That is particularly obvious in the vignettes from the trial session and is also in line with findings reported in Chapter 6, which suggested that distributed visitors appear to prioritise their engagement with their distributed friends over the engagement with the exhibition. This emerging appreciation of sociality in museum visits among distributed companions, with emphasis on the latter word, as it shapes and is shaped through the participants' conduct, may result in new uses of the museum setting and appropriation of the visiting order. Museums may particularly appropriate mixed reality technologies to fulfill their goals with regard to social inclusion and change, as was discussed in Chapter 2. Further studies in this domain are required to enable in–depth understanding of the situation.

This chapter is the last of the three chapters that focused on the presentation and discussion of data from the fieldwork. The following chapter will discuss how some of the topics that have been explored so far may relate to museological and technological practice.

8 | Discussion of findings and contributions

The three previous chapters presented and discussed aspects of the fieldwork of this research. Drawing on vignettes of activity among collocated and distributed participants, they developed discussion around three themes: the collaborative exploration of museum artefacts, aspects of the collaborative management of shared museum visits and the constitution of the visiting order in and through social conduct. The chapters made evident that social conduct among co–visitors is a multifaceted, fluid resource for, and outcome of, the co–visiting activity. This research did not offer evaluative statements and quantitative results. Rather, it highlighted that social conduct in casual group museum visits is context dependent, sequential and deeply situated, and therefore particularly rich. It also pointed out that casual group museum visiting cannot be organised or studied in terms of tasks and outcomes similar to workplace activities, i.e. it would be odd or inappropriate to try to distinguish a successful visit from an unsuccessful one on the basis of the participants' conduct. However, the vignettes indicated instances that communication and interactions among distributed participants appeared problematic.

This research set two main objectives (Chapters 1 and 4): the empirical investigation of social conduct in casual group museum visits, and the exploration and understanding of social conduct in real–time distributed museum visits through mobile mixed reality technology. A third area of investigation was the application of a qualitative methodology based on ethnomethodology and ethnographic methods for the fulfillment of the above objectives. A reflection on the latter will be presented in the next chapter. The development of Chapters 5, 6 and 7 offered a wealth of findings, and pointers towards the study and understanding of social conduct among collocated and distributed museum companions. This chapter summarises and selectively discusses the findings of this research. It also considers how those findings feed back to the disciplines that supported this investigation.

This chapter, however, does not offer design suggestions as such. As Schmidt (2000) pointed out, the ethnographic studies that had the strongest influence in

CSCW did not arrive "at specific design recommendations for specific systems but instead tried to uncover, in minute detail, the ways in which social order is produced in cooperative work settings, whatever the design implications of the findings might be". Additionally, this current research is one of the few empirical studies (e.g. (Brown, Chalmers et al. 2005; Halloran, Rogers et al. 2003)), that have looked at real time distributed leisure activities in terms of social conduct. This thesis, therefore, considers as its primary contribution the understanding of the activity, i.e. what distributed co–visiting might look like and how it might fit with current museum visiting practices. However, it is anticipated that computer scientists and designers, along with museum professionals, will find useful insights among the findings and this discussion with regard to the development of future applications.

8.1 Social conduct among collocated museum visitors re–visited

As discussed in Chapter 2 and demonstrated throughout the thesis, in recent decades visitor studies have shown interest in the study and understanding of social interaction in museums. A series of qualitative and quantitative studies looked at the effect of social interaction on visitors' learning in museums, and offered insights in the design of exhibits and interpretive material. A limited number of studies also looked at the interactional aspects of social conduct and how it might influence engagement with the content of an exhibition (Hensel 1987), the ongoing constitution of museum artefacts (vom Lehn 2002), and so forth. This current investigation adds to the latter body of empirical research that focuses on social conduct in museums and offers further insight in the limited number of studies of interactional aspects of social conduct in adult–only groups of visitors.

This investigation confirmed findings of previous studies, particularly vom Lehn's investigation (2002: 181) that pointed out the "situated or indexical character of meaning and action" in museum visits. Vom Lehn's research also substantiated the claim that co–visitors constitute exhibit features as objects relevant for the interaction at hand through social conduct. Therefore, the study of social conduct may enhance our understanding of the diverse ways that co–visitors access and

make accessible for others aspects of museum artefacts and vice versa. This current investigation, however, also acknowledges that social conduct at the exhibit–face indicates co–visitors' approach to visiting activity as a set of actions and interactions that interweave personal interests and engagement with the exhibition, and social engagement with companions (Bell 2002; Draper 1984). Social interaction among companions in museums can be more effectively understood within this context of interrelations among people and objects as opposed to a research orientation that focuses on relations among people only or among people and objects only.

Furthermore, this research suggests that social conduct has a significant role in every aspect of museum co–visiting, such as the management of the visit. The latter topic has been under–represented in current visitor studies, which primarily and almost exclusively focus on the study of social interaction at the exhibit–face. The fieldwork of this research, which covered the overall course of a group's visit instead of localised data collection around specific exhibits, indicated that social conduct among collocated visitors influences not only their interactions with objects but also with each other; it also influences the overall development of the activity.

Although other qualitative studies have also recorded visits in their full length (Abu-Shumays and Leinhardt 2000; Diamond 1986), the analysis of data took into consideration only the parts that were relevant to the exploration of displays. The current investigation demonstrated that social conduct and collaboration also happen in between displays as co–visitors initiate their exploration or manage their pace. Those moments are of significance for the achievement of collaborative visits, since they open up opportunities to co–visitors for further action. For example, initiation of collaborative viewing and appreciation of artefacts is extensively supported by the collaborative pace of co–visitors (e.g. in vignettes 5.1, 6.3, 6.4). The practices that co–visitors develop to handle the tension between social interaction and personal engagement are particularly apparent in the subtle actions of visit management, and are raised as a promising topic of further investigation. For social conduct among co–visitors at the exhibit–face does not happen in isolation, with exclusive reference to the local milieu, but

is also produced and recognised within the broader context of the visit. This is constantly shaped by the participants in and through social conduct that spans personal and social engagement as well as the reciprocal management of the two.

Additionally, this research also indicated that social conduct is fundamental in the negotiation and constitution of the order of the museum visiting activity. This is an aspect of the social organisation of the museum setting that is very little discussed in visitor studies literature, and is usually referred to as "museum etiquette". It also appears in flux, influenced by new museological trends that encourage museum settings to become multipurpose places where diverse audiences meet and co–participate in a variety of events, activities and experiences. Furthermore, it emerges as an important aspect of the museum visit in the light of developments in museum interpretation media such as personal digital assistants, immersive interpretive installations and so forth. The treatment of the visit's orderly organisation not as a static set of rules but as a context dependent realisation, which is constituted in and through the participants' conduct as they engage with the local resources and the formal and unwritten rules of the environment, indicate that particular technologies and designs may better suit a particular setting than others. It also suggests that this way of looking at current museum technologies, such as audio guides, might contribute towards a more efficient understanding of their advantages and disadvantages in relation to the setting's 'ecology', norms and rules.

Overall, the part of this research that is concerned with social conduct among collocated casual visits builds on and extends existing visitor studies with regard to social action and interaction as it unfolds in the course of museum visits. It indicates that social conduct during co–visiting cannot be fully appreciated when studied through fragmented events at the exhibit–face. It also suggests that the study of co–visitors' use and appreciation of visual, verbal, gestural, social and exhibition–related resources may offer insights into how groups of people approach exhibitions and make sense of museum artefacts. In this thesis, the above mentioned notions also served as reference points for the discussion of social conduct in distributed co–visiting activity through mobile mixed reality

technology. The core findings of that part of the investigation are discussed in the following section.

8.2 Social conduct in distributed co–visiting sessions revisited

The previous section discussed the contributions of this investigation in the study and understanding of social conduct among collocated visitors. Additionally, this investigation focused on the empirical study of social conduct among distributed visitors. In this respect, this research is one of the first attempts to empirically study distributed museum visiting activity, specifically a mixture of local and remote participants, from the point of view of social interaction among co–participants. Previous attempts in the study of distributed collaborative museum visiting focused primarily on the evaluation of technology in terms of usability, and they mainly looked at the conversational aspects of social interactions (e.g. (Barbieri and Paolini 2000; Di Blas, Paolini et al. 2003; Nilsson, Svensson et al. 2003)). Furthermore, the results of those studies referred to participants who were all remote and strangers to each other, i.e. outside the premises of a museum and participating via CVEs and collaborative web environments.

This thesis, however, focused on social conduct that might be produced among companions in the course of a synchronous distributed co–visiting activity. This choice is in line with findings in visitor studies that suggest that the bulk of social interaction among museum visitors is addressed to companions (Falk and Dierking 1992; Falk, Koran et al. 1985). It also follows research in media spaces that pointed out that communication practices in and through distributed media and their study are more effective when they involve users who are familiar with each other and the activity (Ackerman, Hindus et al. 1997; Adler and Henderson 1994). The trial sessions in the *Mack Room mixed reality environment* offered a wealth of information regarding social conduct among distributed museum participants.

It is important, however, to highlight that the *Mack Room mixed reality environment* was a prototype system that was used in trial sessions only. It was not a system open to public use. Neither was it designed to support a specific

service by the cultural institute that it was deployed in. The findings of this research, therefore, are better appreciated when they are considered as supporting understanding of use of technology under development, and not as a critique of a fully developed technological solution to a problem.

The rest of this section discusses the main findings of the study of distributed museum visits with regard to the effect of the combination of heterogeneous media and the asymmetries involved in participants' interactions as well as the increased use of talk during the trial sessions. These aspects of distributed visits appeared of particular relevance and importance throughout the discussion of the fieldwork. Additionally, the potential influence of this thesis in current museum thinking and practice is also outlined.

Heterogeneity in media, environments and resources is a core element of current developments in mixed reality mobile systems and ubiquitous technologies that support collaboration. As Flintham et al. (2003) pointed out the "key to such applications [mixed reality mobile games] is establishing a relationship between humans who are operating across radically different contexts". The *Mack Room mixed reality environment*, as was discussed in Chapters 2 and 3, shared a lot of characteristics with mobile mixed reality gaming applications, with the difference that it did not revolved around a game story or performance. It was instead associated with a visiting activity in a specific exhibition, and therefore was further constrained not only by the geographical and social contingencies of a setting, but also by the participants' preconceptions, experiences and expectations based on analogous museum visiting activities.

The Mack Room mixed reality system was comprised of a range of heterogeneous media, such as traditional museum media, artefacts and interpretive material in various forms, as well as digital, ubiquitous and mobile communication media, such as tracking devices, context–aware maps, CVEs and hypermedia. In their separate use, those media did not appear to impose challenges to the participants. For example, the majority of the participants successfully used the separate environments in their personal exploration and viewing of the exhibition—with few exceptions with regard to participants who initially were unfamiliar with

navigating three dimensional environments. Furthermore, the use of the overall mixed reality environment, as was shown in Chapters 5, 6 and 7, suggested that participants often collaborated successfully in and through the variety of media and used all the media available in the environment such as labels, the handheld device, maps, web content and each other in order to explore the artefacts in the collection. In that respect, they appeared to primarily focus on the "task of visiting" instead of the use of any particular tool or medium (Chalmers 2003).

However, the combination of media in one collaborative activity both revealed to participants the asymmetries in the different environments, and enabled actions and interactions that surprised and challenged the users. Asymmetries also appeared to have an effect on the overall character of the visiting activity, for example by exaggerating the social aspects of it over the personal investigation and attention, as was pointed out in Chapter 6. The following section summarises and further comments on the role of asymmetries in the distributed visiting activity followed by discussion on the increased use of talk within the mixed reality environment.

8.2.1 Understanding asymmetries in collaborative mixed reality visits

In the course of their collaborative activity, participants in the *Mack Room mixed reality environment* dealt with a series of both communicative and content–related asymmetries. This was part and parcel of the design of a system that sought to support communication among distributed participants and also personal exploration and engagement with museum material. Although nowadays asymmetry in information presentation and delivery is sought after in museums and other activities under the auspices of personalisation of content (Filippini-Fantoni 2003; Not, Petrelli et al. 1997), it rises as a challenge when it is combined with real–time communication in collaborative activities. This tension is at the heart of distributed museum visits where personal attention shapes and becomes shaped by social engagement—one would also argue that it is a core element of group museum visits in general. Asymmetry in a non–contextual sense does not appear to suggest a challenge for design or research. It is only when considered within a collaborative situation that it poses particular challenges in its handling.

As shown in Chapters 5, 6 and 7, the asymmetries in the *Mack Room mixed reality environment* spanned the quantity and presentation of the museum content as well as the presentation of social cues. Additionally, they became apparent in the exploration of artefacts as well as in the management of the visit. Furthermore, the asymmetries were not symmetrically associated with local and remote participants. For example, different types of remote participants, hypermedia–based and VR–based, had asymmetric access to the information about each others' actions in the environment. The latter reflected to some extent the variety of technologies that may be available to users at any given time, for example hypermedia–only solutions for users with low bandwidth access. It also offered opportunities for exploration of different features, for example the use of three dimensional graphics alongside two dimensional map representations for the delivery of information related to spatial arrangements. However, this aspect of design often challenged the cohesion of the overall co–visiting activity and increased the participants' need for coordination, as was discussed in Chapters 5 (especially section 5.1.2) and 6.

In terms of content associated asymmetries, this research indicated that two aspects of asymmetries were particularly relevant to the distributed co–visiting activity: asymmetries related to the presentation of museum artefacts and information about them, and asymmetries related to the presentation of the spatial organisation of the exhibition. Asymmetries associated with artefacts and the interpretive material of the exhibition had an overall positive effect in the interaction among participants. In the Mack Room mixed reality sessions, asymmetries in the presentation of information about artefacts became a resource for engagement and conversation among the participants who described their views to their friends, read labels aloud and pointed out aspects of the display that were not available or were obscured in the different views. In that respect and according to participants' comments in the debriefing interviews, differences in the content were to be expected: as one of the off–site participants said "I expected that I would have more text so I could look up and tell you [to her friend] more things than you would be able to get". Differences in artefact information also supported longer engagement and persistent exploration of the available content, as was indicated in vignettes 5.3 and 5.4.

On the other hand, asymmetries related to the spatial features of the environment, for example the position of artefacts in the environment, appeared problematic in the course of collaboration. Since spatial features were important resources for the participants to organise their collaborative activity and viewing, discrepancies in the presentation of spatial organisation lead to prolonged efforts to establish coordination, as was shown in vignette 6.3. Furthermore, similar discrepancies afforded a sense of mistrust of other features of the system, for example the position tracking information—which was further substantiated by inaccuracies introduced by limitations in the tracking system itself. This situation had also an effect on social conduct among participants, who in several cases developed a habit of verbally describing their actions and their environment as a means to keep their friends effectively up–to–date of their whereabouts. The latter was also associated with asymmetries in social cues.

The topic of communicative asymmetries is probably the most discussed aspect of asymmetries in distributed collaborative environments. Research on communication over media space technology (Heath and Luff 1992a) and achievement of collaborative tasks in CVEs (Fraser 2000) has pointed out that mediated environments do not effectively support the visual cues that comprise an intrinsic aspect of face–to–face interaction, such as timely facial expressions and peripheral awareness. Seen from a face–to–face perspective to communication (Heath and Luff 1992b), the *Mack Room mixed reality environment* also offered limited support to a series of visual cues such as gesture, body posture and so forth. Location and orientation information, however, successfully contributed to establishment of awareness. The most evident shortfall, however, was the disassociation of one's position and orientation from one's view, as was discussed in Chapter 5. In that respect, the side effects of communicative asymmetries were not necessarily related to lack of specific resources but of adequate resources for the achievement of communicative actions—this is also supported by findings reported in (Billinghurst, Bee et al. 1999) with regard to asymmetries between wearable and traditional collaborative interfaces. For example, in the collaborative exploration of artefacts in the *Mack Room mixed reality environment*, once participants had located the artefact in question, facial expressions, orientation and posture were not essential for a successful interaction. On the other hand, accurate

orientation and also gesture appear of importance in the stage of common alignment towards a display. Additionally, an open audio channel in contrast to the more natural range–based function of the audio facility became one of the most valuable and used resources for communication, awareness and coordination.

Overall, this thesis suggests that the issue of asymmetries in distributed mixed reality environments needs to be handled with care and sensitivity to the particular activity in hand. In distributed group museum visits, asymmetries in spatial representations regularly led to breakdowns in communication. On the other hand, asymmetries in the presentation of content were creatively used and to an extent anticipated by the participants. This finding is also in line with the use of asymmetric content in mobile mixed reality games (Crabtree 2004b). However, it should be emphasised that asymmetries in content in distributed museum visits should be carefully designed so as to not compromise the participants' expectations for collaboration and co–participation in the activity. Further research from a content design perspective would be beneficial here. Additionally, this thesis suggests that communicative asymmetries in distributed environments are better understood when examined within the context of the hybrid setting and the actions involved in specific activities. In that respect, elements of communication that may appear problematic at first, may subsequently be proved useful within the distributive setting. The following section focuses on one of these elements, namely the use of talk.

8.2.2 Reconciling asymmetries and constituting the environment through talk

The previous section discussed the asymmetries afforded by the mixed reality museum environment and how they became apparent in several aspects of the distributed visiting sessions in the Mack Room. It also suggested that communication among the participants was not always problematic due to asymmetries in the environment. Instead, asymmetries in the delivery of the museum content in several cases became a resource for longer engagement with artefacts and companions. The section also indicated that problems in coordination due to asymmetries were handled by the participants through talk. This section is particularly concerned with the increased use of talk among

distributed participants. It explores the topic with reference to the previous section, and also the three previous chapters that presented data from the co–visiting activity, and suggests that increase of talk in distributed visits cannot be fully understood as merely a means of handling asymmetries and achieving coordination. This section may then contribute to both the appreciation of talk in visitor studies and the understanding of emerging changes in the role of talk in distributed activities (see also (Ruhleder and Jordan 2001)).

Conversation among collocated visitors has been extensively studied in visitor studies literature—some examples were presented in Chapter 2. The length and the content of conversations have been particularly used as criteria for the evaluation of exhibits (McManus 1991) and the identification of learning processes in museum visits (Abu-Shumays and Leinhardt 2000; Leinhardt and Knutson 2004). Although a small number of studies (Diamond 1986; Hensel 1987; Leinhardt and Crowley 2002) have identified two types of talk among museum visitors, organisational and artefact–focused—also referred to as "learning/teaching talk" (Hensel 1987)—the majority of the studies focused primarily on discussions that are related to the exploration of artefacts, e.g. naming of artefacts, explanation of artefact features and so forth. Artefact–focused conversations are triggered by displays and exhibitions, and give speakers the opportunity to share their knowledge and interests, and to develop their own ideas. Therefore, this aspect of talk has been particularly popular among researchers who look at the learning outcomes and the evaluation of exhibits. The shared content of the exhibitions that is available to everyone in the gallery, and the shared context, in the form of past common experiences and related aspects of visitors' relationships, support co–visitors' discussion and exchange of opinions.

Recent studies of technology in museums, and especially of use of personal mobile devices, have shown that interaction with technology might inhibit social interaction as well as redirect one's attention from the museum artefact to the information that is delivered on one's device (vom Lehn and Heath 2003). Among the most reported disadvantages of such technologies is the decline of talk among visitors, e.g. (Walter 1996). In contrast, the study of the mixed reality environment in the Mack Room reported a radical increase in talk among participants. In

distributed visits, the increased use of talk surprised the participants who named it among the significant differences between the mixed reality museum visit and traditional museum visits, and a reason to pursue distributed visiting. For some of the off–site participants the experience was liberating: "I think it is fun though. I quite enjoyed the social engagement in that way, being able to talk about everything more and not feeling that you are disturbing...not thinking about other users in the gallery. You know it's kind of liberating", and for others it was a laugh: "I thought it was actually fun, and I thought it was a laugh; an easy pleasure".

In the fieldwork from both collocated and non–collocated visits, verbal communication appeared to be one of the most used and effective resources of communication among participants. Participants during the trial sessions in the *Mack Room mixed reality environment* conversed constantly. Their conversations were both artefact–focused and organisational. The artefact–focused conversations, as shown in Chapter 2, included exchange of comments, reading labels aloud, expressing opinions about the aesthetics of artefacts and creating relations between the current visit and previous experiences in the lives of the participants. The organisational conversations covered a great range of information: descriptions of each participant's environment, their representations in the system, the look and feel of the hybrid displays, and directions as to where people or exhibits were—these types of conversation are evident in all vignettes from the mixed reality environment presented in Chapters 5, 6 and 7.

Organisational conversation may initially appear to have developed at the expense of the visiting activity. Increase of talk in technology supported distributed activities has been reported before, especially in tasks that involved real–time coordination (Dourish and Bellotti 1992). Furthermore, this increase has been attributed to a lack of other social cues and it has also been criticised as disruptive of the main activity (Hindmarsh, Fraser et al. 1998). Barbieri et al. (2000) also suggested that organisational talk dominated the conversation of remote visitors in a museum CVE. However, this section suggests that in the mixed reality museum environment the clear separation of organisational and artefact–focused talk is neither straightforward nor useful. Instead, organisational talk often appeared to

facilitate the exploration of the hybrid environment and to further the participants' engagement with the exhibition.

This claim is based on instances presented in the vignettes included in the previous chapters as well as cases where discussions among participants appeared to combine personal opinions with descriptions of the environment and their own activities. Those discussions were in many cases designed to fit with their companions' perspective of the environment and took into account one's working knowledge of their companions' view. For example, in vignette 5.3 (section 5.1.2) the VE participant started using the dates on the *Timeline* to refer to paintings and to facilitate collaborative viewing with the hypermedia visitor; she was subsequently followed by the local participant who also used the dates to confirm and establish collaborative viewing. Although the use of dates was not observed as an important mechanism in the exploration of the *Timeline* among collocated participants, who instead used gestures predominantly, it was constituted as such among non–collocated visitors through their interactions with each others and the displays.

In a separate case, the local participant described to his companions the central partition of the gallery as a boomerang–shaped wall ("There is a big thing along, it looks like a boomerang shape, that's a big wall with… glass, with pictures on it"). The local visitor's verbal description drew on elements that were relevant to his knowledge not only of the local environment but also of the map representation of the same environment, for example the reference to the wall as a "boomerang". It was also informed by the participant's working understanding of his friends' view. The local visitor's description of the wall appeared to be 'constructed or designed' with reference to the environment of the 'recipient' of the description (Sacks, Schegloff et al. 1974), in this case the hypermedia participant. Furthermore, the section about the role of awareness in co–visiting (section 5.2.2) also showed examples of organisational talk, for example the verbal description of the VE participant's own position and attention, which subsequently triggered and informed further engagement and artefact–focused interaction among the rest of the participants.

In those conversations, the description of one's movement, attention and view of the environment did not only offer an account of the activity as experienced by the speaker, but also revealed and reshaped the available resources for communication and established terminology to use in future discussions, i.e. the term "big wall". In the example with the reference to the boomerang–shaped wall, the information about the material aspects of the wall was particularly valuable to the hypermedia participant who had only a two–dimensional map representation of the gallery, and therefore could see a partition in the room but could not safely assume its size and constitution. The establishment of shared terminology to discuss and refer to spatial features was crucial in sharing the activity and maintaining collaboration. For example, the existence of the wall in the room suggested that local participants could not walk through it and therefore they would be expected to walk around it when they wanted to go from one side of the room to the other. This condition also supported a series of jokes among the participants, since VE participants could walk through the wall and indeed inside the wall. Furthermore, local participants, due to inaccuracies in the tracking system, were observed to jump from one side of the wall to the other, to the amusement of his/her companions. Those elements, i.e. the chronology indications on the *Timeline*, the reference to the "big wall" etc., were initially used by one person in one environment or medium, but became collaboratively used by all participants in their interactions, as was observed in vignettes 5.3 and 5.6.

Although these aspects of conversation do not appear to be directly related to the exhibition, and in the case of task–based interactions in CVEs have been criticised as inhibiting interaction by breaking down the sequence of conversation through the insertion of non anticipated utterances (Hindmarsh, Fraser et al. 1998), they appeared of significance and importance for the collaborative exploration of displays in the mixed reality museum environment. They supported the establishment of common[24] points of reference, they offered a basis for shared experience and they revealed the way visitors went about interpreting the exhibition elements. This was also suggested in one of the remote participant's

[24] Schmidt and Bannon (1992) discussed the terms "shared information space" and "common information space" to suggest that the former may effectively support collaborative activities only by becoming the latter, at least temporarily, through negotiation among the actors involved. An extension of this discussion also appears in (Bannon and Bødker 1997).

comments: "so I think you sort of interact with the stuff you are looking at in a different way because it's almost translated for different purposes, express it to tell other people about, and compare it to what other people see. It gives a different kind of perspective."

Going back to the initial categorisation of group conversations as organisational or artefact–focused, this section argues that such a division is not straightforward or clear in terms of both conversation units and function in the museum mixed reality environment. As shown in the conversations of the participants during the trial session, the landmarks, and other dominant features and elements that made up the hybrid sum of the mixed reality environment of the gallery, were revealed and composed together in the course of the activity in and through social conduct. Furthermore, the process of constituting the elements of the exhibition environment was closely interwoven with the process of engaging with the exhibition. This does not suggest that all conversations in the mixed reality environment were unproblematic or that all talk can be clearly defined as artefact–based. It points out, however, that conventional approaches to studying face–to–face social interactions among people, and among people and their environment, as well as conventional ways of talking about social conduct, do not clearly apply to studying and understanding distributed social conduct (Dourish, Adler et al. 1996) without modification or, at least, awareness of the differences between interactions in these different media.

8.2.3 Towards mixed reality museum visits

Beyond the findings with regard to the asymmetric character of the mixed reality environment and the changing role of talk in distributed visiting activities, the trial sessions also suggested a set of findings that relate to the evolving character of real–time distributed museum visits. Those findings, such as the strong social and collaborative character of distributed visits, do not address issues of technological design or social conduct as such. Rather, they offer insight into how experimental settings such as the *Mack Room mixed reality environment* may shape the way museums think of and cater for remote audiences and consider technologies that bridge traditional and digital museums settings. The empirical grounding of this research is of particular importance in the emerging field of museums and new

media, which primarily focuses on theoretical investigation of those issues. This section discusses some of the findings that are associated with the role of museum artefacts in mixed reality museum environments, and the complementary design of traditional and digital museum settings. It further outlines some practical considerations.

The separation between physical museum experiences and digital visits on the basis of the media in use is at the heart of the discussion about the deployment of new media in museums, as was discussed in Chapter 2. This distinction, however, appears to stem from focusing on the individual media and their differences, instead of their use in context, the latter being dynamically (re)constituted through social conduct. Instead, this current investigation prioritised the study of the overall visiting activity, during which media were used and appropriated, over the study of particular media features and qualities. This approach resulted in the capture of many instances, during which differences among media and particularly the distinction between on–line and on–site did not seem to inhibit discussions, jokes and exchanges among distributed participants regarding museum artefacts. As was discussed in vignettes presented in Chapter 5, the distributed friends used the displays at hand to initiate their discussions, and complemented it with their knowledge of each other's habits and tastes. The distance, the diversity of the environments and media did not seem to inhibit their shared appreciation of displays. This suggests that a more fruitful way of looking at mixed reality environments in museums is to treat all media—new and old—as potentially equal resources in the course of interaction. In other words, within their features and possible uses, different media may embody equally significant opportunities and threats with regard to the engagement with and enjoyment of an exhibition.

This concept is further supported by another finding from the vignettes presented in this thesis, in particular vignette 5.6 in which two of the distributed companions decided to follow each other in the gallery. Participants in the Mack Room trials often followed each other in the course of their visit. Remote participants followed their local friends around; they also invited them to displays or suggested points of interest to them. Local participants invited their friends to join them where they

were standing in the gallery, and exchanged suggestions on where to go next. Social conduct supported their interaction in and through physical and digital environments, and facilitated the blending of media and environments in one common activity. The participants appeared willing to follow their friends regardless of the media they were using, passing the 'leading role' among them. Although one might expect the on–site exhibition to primarily shape people's choices, inspection of several cases suggested that participants often treated all environments as equally useful resources for interaction as long as they supported the activity at hand. Additionally, their personal relationship and previous shared experiences appeared to also influence their actions.

Furthermore, unlike the displacement of the museum artefacts and the shift of visitors' attention from the artefact to the information about it, which is reported with mobile devices (Bellotti, Berta et al. 2003; vom Lehn and Heath 2003), in the mixed reality museum environment, the displays were constantly in the focus of attention. The hybrid character of the displays, which meant that the participants interacted with different presentations of the display according to their media, provoked discussions around the displays, as was explained in previous sections. Furthermore, elements of the different environments, both physical and digital, were blended into the discussions as participants referred to them and described them for their friends. In that respect, elements of the materiality of the collection, the lack of which is often associated with the lost 'aura' of virtual museum objects (Hazan 2001; see also Hein 2000: 149-51), became apparent not only through verbal communication but also in the local participant's interaction with the environment. For instance, remote participants had access to how it feels to sit on a Mackintosh chair through the communication of their on–site friend.

Moreover, by supporting social cues, the Mack Room system created a sense of togetherness and engagement for the participants in the visit, which was highly valued in the debriefing interviews, as one of the remote visitors said to her on–site friend: "it would actually be nice to share opinions as you were looking, rather than sat down and have a coffee afterwards to talk about what you've seen. A bit more engaged…". The appreciation of the fieldwork, however, suggested that in many cases, social interaction was favoured above individual engagement with the

museum displays. The initial studies of collocated visitors had established that collaborative exploration of displays is based both on strong personal engagement and social interaction. Therefore, mixed reality environments, similar to the Mack Room prototype, would benefit from focusing equally on attracting and sustaining personal engagement with the exhibition along with the support of group collaboration. This issue also emerges as a relevant topic of research in ubiquitous mobile applications that explore the delivery of personalised information in leisure activities that might be undertaken by groups of people.

The design team of the Sotto Voce electronic guidebook (Aoki, Grinter et al. 2002) dealt with a similar concern by awarding strict primacy to the commentary choices made by the user, as opposed to available commentaries through eavesdropping. In mixed reality environments, one way of achieving this would be by further exploring and exploiting the individual characteristics and affordances of each medium, for example by introducing complementary asymmetries in the quantity and type of information, e.g. having historical information about a painting presented to one person while another contributes technical information about its production. This approach would also contribute towards the inclusion of flexible and open–ended resources that reportedly may create and sustain interaction among museum visitors (Hindmarsh 2002).

From the discussion so far, it is evident that mixed reality environments may enhance visitors' experience but they also introduce practical challenges with regard to the ecology of the museum environment and issues of maintenance and updating. The remote participants, free of constraints usually imposed by the museum's sheer materiality as well as the corresponding social etiquette, were able to explore the displays and the environment in an unusual manner. Technology enabled remote participants to do things impossible by human standards, for instance passing through walls, as well as things incongruous with museum customs, such as racing each other. In the interviews, most of the remote participants mentioned this kind of freedom as one of the advantages of the experience. They were aware, however, of the fact that the person in the gallery was accountable for his/her behaviour among other visitors. The unexpected navigation choices e.g. radical changes of direction, *impromptu* disruption of other

visitors' field of view and so forth, was the most noticeable change in the visiting manner of the on–site participants. Similar socially disruptive behaviour was also reported by vom Lehn and Heath (2003) with reference to users of audio guides.

It would be anticipated, however, that subtler behaviours would be developed as users become familiar with systems over longer or more regular periods of use. This claim is based both on previous research that reported changes in social conduct over long periods of use of media spaces (Dourish, Adler et al. 1996) and theoretical investigation based on hermeneutics (Chalmers and Galani 2004). However, museums' limited funds and expertise in the field of new media as well as wider issues of under–resourcing often refrain cultural institutions from committing to long–term study and evaluation of prototype systems or multiple iteration of application before they become permanent features of an exhibition. The quick turn–around time of museum displays was not reflected in the prototype application of the *Mack Room mixed reality environment*. Nevertheless, the impact of social interaction among on–site and off–site visitors on the navigational ecology of the gallery, as it was pointed out by the empirical material of this research, is worth revisiting.

Furthermore, hybrid exhibits that enable social interaction around and about displays also impose maintenance challenges to museums. Although asymmetries in the content appeared fruitful and often sparked further exploration, the hybrid character of the exhibits effectively means that changes in one environment should be reflected in the others, so people can orientate themselves towards the same display. Therefore, at present, mixed reality systems may be better suited for temporary exhibitions that do not change in the time period of the show, or permanent exhibitions that change little. Exhibition spaces that are already designated for educational activities may also become fruitful grounds for distributed visiting sessions.

Additionally, issues with regard to maintenance of mixed reality environments highlight the need for development of interfaces that facilitate the manipulation and configuration of technologies by museum professionals themselves. Current mobile mixed reality environments are primarily based on bespoke technologies

and prototype applications run exclusively by technologists. Their full potential, however, is unlikely to be met without the development of lightweight, intuitive tools that will enable designers of activities, such as performers, museum professionals and educators to update applications or create alternative activities that fit with their needs and goals. Work within Equator IRC that looks at the use and potential of mobile pervasive games also substantiates this suggestion (Flintham 2004).

On reflection, mixed reality environments and related technological applications in museum settings that have been presented in the thesis, are prone to the criticism of utilising museum settings as test beds for technological innovation rather than committing genuinely to the aims and objectives of particular institutions. Among Human–Computer Interaction researchers, museums and science centres are considered as "excellent locations" for testing ubiquitous systems (Fleck, Frid et al. 2002)—an understanding that is also supported by sociological research (vom Lehn, Heath et al. 2001). Although the *Mack Room mixed reality environment* was also based on an academic initiative, several steps that were taken in the course of this research, such as the early consultation with members of staff, the initial observations of visitors in the gallery, the sensitive recruitment of participant to the trials and the subsequent feedback of the findings to the institution, supported the appreciation of the context of the gallery and subsequently informed the analysis of the data. However, the parallel exploration of issues regarding accessibility and connectivity, social inclusion, interoperability and digital copy right ethics, which are related to the modern role of museums as providers of informal learning, on–site and on–line, and agents for social change, was beyond the goals of this research. This thesis acknowledges that further attempts to develop mixed reality applications for museums settings should take into consideration both the aims of the particular institution as well as the limitations of the setting.

Overall, this thesis suggests that mixed reality environments (or elements of them) may become an alternative avenue for enhancing visitors' engagement with the exhibition by supporting social encounters among visitors. The trial sessions in the *Mack Room mixed reality environment* indicated that visitors were engaged in

rich and topical coherent interactions with each other and with the exhibition. Despite the experimental setting, local and remote museum visitors often appeared to participate in a co–visiting activity. In this co–visiting experience, the museum's remote presence was treated not strictly as an information space, used in isolation, but also as a social place to visit, enjoy and relate to others. The latter afforded a set of behaviours that, as was discussed in the previous chapters, constitutes a social experience that shares several significant attributes of traditional museum co–visiting. This approach moves away from the traditional design focus of museum applications on single users, toward multi–user interaction that treats the traditional and new media aspects of a museum as equally important elements of the visiting activity. Furthermore, it prompts museum design to address both personal and social aspects of the visit by supporting the individual's engagement with displays, which can become a resource for social interaction, and which in turn might inform later individual interpretation.

8.3 Conclusion

This chapter offered a selective overview of the findings from this research. It particularly focused on findings that appeared significant with regard to the motives of this research, i.e. the study and understanding of social conduct in collocated group visits and distributed group visits in a mixed reality environment. The discussion of the findings was based both on material presented in vignettes included in the previous chapters (Chapters 5-7) and also opinions voiced by the distributed participants during the debriefing interviews of the trial sessions.

This chapter concluded the presentation of 'evidence' and the discussion around the core issues of this research and suggested the contributions of this thesis in the disciplines of visitor and museum studies and CSCW, in particular collaborative activities over mobile mixed reality technology. In terms of the former, this thesis expands the current approaches in visitor studies, which focus on social interaction at the exhibit–face, to cover the study of social conduct in the management of casual group museum visits and in the ongoingly constitution of the visiting order. It also pioneers the study of social conduct and particularly its interactional qualities among distributed visitors. Similar approaches have been

very sparse and are limited in the study of social interaction in collaborative virtual environment museum application, e.g. (Bellotti, Berta et al. 2003; Di Blas, Paolini et al. 2003). Additionally, it contributes to the emerging field of museums and new media, especially in issues that relate to the study, development and support of remote audiences and the use of new technologies as enabling connections among people and environments instead of just delivering information. The findings of the thesis also contribute to the further understanding of the types of asymmetries and their role in mobile mixed reality environments that support museum visiting. They also add to the field of social research that is concerned with the changing role of conversation in distributed settings.

The following chapter concludes this thesis with a reflection on the methodological choices of this research and an outline of future research perspectives.

9 | Conclusion

This thesis investigated social conduct in the moment–by–moment achievement of co–visiting among collocated and non–collocated visitors, with an emphasis on the latter. For that purpose, it reviewed the relevant literature in the fields of museum studies and computer science. It drew in particular on research within the fields of visitor studies and Computer Supported Cooperative Work (CSCW). On the basis of an ethnomethodologically–informed approach, it presented data from observational studies of collocated and distributed visitors in two cultural institutions in Glasgow, UK, the House for An Art Lover and the Mackintosh Interpretation Centre, in The Lighthouse. The discussion highlighted the ways in which social conduct is interwoven with companions' shared exploration of museum artefacts and content, their management of the visit through initiation practices and collaborative pace, and the appropriation of the museum environment and the visiting order. Furthermore, Chapter 8 offered an overview of the findings of this investigation and pointed out how particular findings relate and contribute to visitor studies and museums and new media research. It also discussed the thesis' contribution to CSCW research, with regard to understanding asymmetries in mobile mixed reality environments, and to social studies research with regard to exploring the changing character of talk in distributed collaborative settings.

It is important to clarify that this thesis worked on the premises of exploration of collaborative practice in collocated and distributed museum visiting. Therefore, the core purpose of this thesis was the development of understanding of casual group museum visits, which consequently may facilitate the enrichment and support of co–visiting for a greater group of local and remote audiences. This current investigation treats mixed reality technology as an additional avenue to museum remote co–visiting. It does not perceive technology as a means to substitute or replicate traditional museum visits. The same applies for other applications mentioned in this thesis, such as the Virtual Leonardo project and the virtual tour in the Van Gogh museum. In that respect, Lamarches' (1995) claim, that audio guides, information handouts and panels are not interchangeable and therefore demand individual design treatment may also apply to the technologies

that were discussed in this thesis. That is to stress that understanding the activity to be supported—in its individuality—as well as the capabilities of available technologies should be the first step in the design and adoption of innovative technologies.

This chapter concludes this thesis by reflecting on the methodological choices taken in this research and by suggesting potential future exploration that builds on the research presented in this thesis and extends it in technological, methodological and theoretical ways.

9.1 Methodological approach revisited

The research presented in this thesis followed a specific methodological approach to the exploration of the topic, as was discussed in Chapter 4. This approach drew particularly on the ethnomethodological notions of accountability and situated action to investigate the role of social conduct in the existing collaborative practices of museum co–visiting and in the newly developed practices of distributed museum co–visiting. It worked on the assumption that the production and recognition of social conduct among museum companions is observable and reportable, through the examination of the details of action and interaction and, as such, it can be studied to support the understanding of the role of social conduct in the co–visiting activity from the perspective of the members in it. Additionally, the research combined video recordings with ethnographic data, such as field notes and interviews.

The combination of methods proved suitable for the task at hand. The detailed observations and video recordings offered access to mundane interactions and expressions of conduct among companions, which often escape the attention and care of visitor studies researchers. For example, the role of pause in communicating engagement and disengagement among collocated visitors (section 6.2.2) and the evolving use of common terms as reference points among distributed participants (section 5.1.2) became apparent through close investigation of fragments of detailed interaction. On the other hand, the ethnographic material supported understanding of the wider context of the visit,

which is often overlooked by studies that concentrate on detailed inspection of interaction among visitors. For example, the ethnographic material supported the discussion around the visiting order and how it may be challenged by the introduction of mixed reality technology (Chapter 7). The material generated from the recordings from inside the mixed reality system alone would not be able to sustain such understanding, as has also been reported in other studies (Bowers, O'Brien et al. 1996). Additionally, the ethnographic part of the research informed the identification of the focal themes of the three chapters that presented the fieldwork (Chapters 5, 6 and 7).

In terms of the analytical orientation of this thesis, the notions of accountability and situated action proved both helpful and fruitful. The notion of one's accountability towards one's companions helped in the understanding of conduct in the management of the visit in both collocated and distributed visits. Social conduct in the initiation and pacing of the visit is mutually accountable and supports the companions' collaborative visiting activity. Furthermore, the notion of overlaid and/or conflicting accountabilities shed light on the tension arising between the local users of the technology and the expected order of the museum setting. This particular use of accountability as an analytical device also appears promising in the investigation of the use of interpretive personalised media in galleries and their interplay with a gallery's interactional 'ecology'.

Furthermore, this research benefited from looking at the situated character of activity with regard to understanding social conduct as an outcome and generator of local resources for interaction. In that respect, the notion of situated action shaped two fundamental findings of this research. Firstly, it highlighted the need to treat distributed museum visits as a separate activity and not as directly comparable to the activity of collocated visiting, and secondly, it highlighted the need to treat both conventional and new museum media, and the topical use of them, as equally beneficial (or indeed detrimental) resources for interaction.

Furthermore, another concept used in ethnomethodological investigations, breaching experiments, proved helpful in dealing with the analysis of the fieldwork. Although the mixed reality visiting sessions in the Mack Room were

not designed to function as breaching experiments, the parallel analysis of data suggested that findings from the mixed reality sessions could offer insight and stimulus for the analysis of practices among collocated visitors. For example, the role of social conduct in managing the pace of a group visit became apparent when maintenance and management of collaborative pace appeared problematic in the distributed visits. In that respect, the methodological choice of using different sets of data to mutually inform each other, instead of using them for the purpose of comparison, opened up new avenues for constructive critique and understanding of the co–visiting activity overall, and the use of technology in context in particular.

However, a note of caution is necessary with regard to methodological aspects of this research. As mentioned in several instances throughout this thesis, the investigation of distributed visiting is based on fieldwork and video recording of a quasi–experimental setting. Aspects of the experimental nature of the setting, such as the unfamiliarity of the participants with similar settings and the relatively young age of the participants, should be taken into account when one attempts to generalise findings about the companions' action and interactions with each others and the environment. Relative changes in the methodological approach could remedy this weakness, as will be discussed later in this chapter (section 9.3).

Furthermore, the combination of multiple sources of qualitative data proved particularly challenging in terms of the organisation, analysis and presentation of excerpts and relative arguments. That was evident in the analysis and presentation of data from the hypermedia and virtual environments, where some loss of detail was inevitable. As was mentioned in Chapter 4, this was due to the lack of means to record the activity in the hypermedia and virtual environments in a manner suitable for replaying alongside the recordings from the gallery environment and the map logs. This aspect of research, i.e. the challenge of combining, revisiting and sharing qualitative data from multiple sources, currently emerges as an important research topic in itself for multidisciplinary research that attempts to

include qualitative data from a variety of sources[25]. This thesis demonstrates that the combination of multiple sources of data can yield interesting and useful insights in understanding mixed reality environments and therefore the support of the process in the form of technologies and infrastructure might effectively influence our understanding of such technologies.

Research presented in this thesis indicated that sociological methods in the study of museum settings, such as observational studies and ethnography, may be particularly insightful in understanding the museum visit, local or remote, from the point of view of the participants. It also indicated that analytical approaches that are concerned with untangling the dynamic character of the visit, as an activity that shapes and is shaped by social conduct, may be a constructive platform for technological innovation in museums. Furthermore, the investigation of resources that visitors use to make sense of the visiting activity, these being verbal and visual cues, gestures, objects and so forth, may become particularly useful in the development of inspiring remote visits that take advantage of a variety of technological capabilities.

9.2 Highlights of the thesis

This thesis assumed the importance of social conduct in casual group museum visits and the lack of support for sociality in remote museum visits, and aimed at exploring those topics further through empirical research of both collocated and distributed visiting activities. Chapter 2 offered an overview of the notion of sociality in museum studies literature and in technology–driven research respectively. It identified the persistent focus of museological research on the cognitive aspects of social interaction among museum companions and the limited investigation into the interactional aspects of social conduct in museums—particularly in parts of the visit that do not happen at the artefact–face. In that respect, it grounded the need for further research in the field. Chapter 2 also highlighted the exploratory character of emerging mobile mixed reality

[25] The e-Social Science initiative, from the Economic and Social Research Council (ESRC), (http://www.esrc.ac.uk/esrccontent/researchfunding/esciencecentre.asp) acknowledges the challenge to record, present and disseminate qualitative and quantitative social science research. It also encourages the development of technological means, utilising Grid technologies, to support this objective.

technologies as well as their primary use in artistic performances and gaming. Therefore, the potential of mixed reality technology to support alternative expressions of existing leisure activities, i.e. group museum visiting, was presented as a valid topic for exploration.

The methodological challenges of this research were outlined in Chapter 3, and the methodological choices were presented and justified in detail. In particular, Chapter 3 explored the need for a combination of detailed observations (through video recordings) with ethnographic material, based on field notes and interviews, and the rather novel approach of recording the full duration of visitors' engagement with an exhibition, as opposed to visitors' fragmented interactions around specific displays. The ethnomethodological notions of accountability, situated action and indexicality were presented as potentially advantageous ideas in the analysis of the fieldwork. A reflection on the suitability and effectiveness of the methodological orientation was presented in the previous section (section 9.1).

The presentation of the empirical part of this research was developed in Chapters 5, 6 and 7. Each one of these chapters was developed around a theme that derived from the ethnographic investigation. They particularly explored issues of social conduct with regard to interaction around displays (Chapter 5), aspects of the management of the visit (Chapter 6) and the dynamic constitution of the visiting order. Among others, issues of collaborative alignment, awareness, indication of engagement and disengagement and conflicting accountabilities were discussed, to mention just a few. Findings from the collocated visiting activity offered reference points for the discussion of the distributed visiting activity, and observations from the latter informed further investigation of the former.

Findings of this research were discussed throughout the presentation of the fieldwork. Additionally, Chapter 8 offered a selective overview of the outcomes of the empirical investigation and further discussed them in relation to their contribution to museological, technological and sociological research. Findings of this research fit with and extend research in visitor studies with regard to social conduct among both collocated group visitors and distributed ones. The thesis suggests that social conduct in all aspects of a co–visit shapes the overall activity,

which is ongoingly constituted in and through companions' engagement with each other and the exhibition setting. The findings of this research also cast light on the ways technological asymmetries are handled in the course of a distributed co–visiting activity. On that topic, the thesis suggests that conduct in mobile mixed reality environments is expected to be different from face–to–face communication and therefore should be approached with reference to communicative achievements and not specific communication resources, used in face–to–face communication, such as gaze, posture and so forth.

The examined technology appeared to support a mixed reality museum visit that may cover needs and expectations that are not easily addressed by the traditional museum. Remote visitors, disenfranchised by geographical or other barriers, may interact with the layout and content of an exhibition and become immersed in exploration of and discussions about artefacts. Local visitors may also access information on–line, with the difference that they can use the contributions, experience and understanding of their remote friends, in a fashion similar to collocated visits. However, an undertaking of this sort, from the museum's perspective, involves considerable investment in developing and maintaining technology. This highlights the need for technologists to offer suitable interfaces for these technologies to be used and appropriated by museum professionals.

The strength of and the challenge for the research lies in the objective to offer access to the 'big picture' regarding to the co–visiting activity, while maintaining an in–depth understanding of aspects of social conduct, that were particularly interesting and significant in the achievement of either the collocated or the distributed activity. This attempt involved the combination and synthesis of approaches derived from museum studies, social studies and technological research—in particular workplace studies and CSCW. The research presented in this thesis could be extended in many ways in the disciplines that it involves.

9.3 Topics of future investigation

As was mentioned in the Introduction of this thesis, this research was conducted within the *City* project of Equator IRC, which has a continuous interest in mobile

mixed reality applications. Project research at the University of Glasgow that followed this current investigation has already developed and tested a new version of this technology in an outdoors tourist activity that involved local and remote participants (Brown, Chalmers et al. 2005). Apart from applying similar technologies in different settings, this current investigation suggests that three possible strands of future work appear particularly relevant and promising with regard to mixed reality technology in museum settings.

Findings of this research suggested that the notion of accountability in the study of mixed reality technology may be fruitful in fully appreciating the ways technology fits within a particular setting. The concept of accountability in technology design has been discussed before, e.g. (Dourish 2001), especially with reference to technology development that reveals the idiosyncrasies of systems to enable users to deal with problems (Fraser 2000). However, findings of this current research suggest that use of technology in the museum context cannot be fully understood without taking into account the accountabilities present among the participant in a setting. Furthermore, the trials in the Mack Room indicated that the introduction of mixed reality technology, which by definition offers simultaneous access to separate contexts for a group of people, may challenge and indeed introduce tension in accountabilities among participants as well as among participants and the norms of the settings involved. It is appreciated that accountability among members in an activity is not static but is dependent on the given circumstances, as was discussed in Chapter 7. Therefore, a way of further understanding accountability in mixed reality museum environments would be the study of technology in context over a longer period of time. This would permit the familiarisation of the participants with the technological features and would also indicate changes that might occur in the overall perception of accountability in those settings. The case of use of mobile technologies in public places, and how their use has evolved during the last decade, might be particularly useful in this investigation.

Additionally, the research presented in this thesis was primarily focused on casual group museum visitors. However, during the trial sessions, data regarding question–based, structured activity were also collected. This fieldwork could

become the starting point for looking at mobile mixed reality technology for more structured visits of an educational character, such as guided tours and structured group activities. This would be in keeping with the current focus of museum practice on learning, and the ongoing efforts by museums to utilise web technologies to support learning and informal education remotely, as in museum initiatives such as the STEM[26] project in the Science Museum in London. Furthermore, evidence from previous studies of the use of mobile devices (Exploratorium 2001) and on–line guided tours in CVEs (Di Blas, Paolini et al. 2003) in museums indicated that structured museum activities among distributed participants were both enjoyable and effective regarding participants' collaboration and conversation. This approach would permit the comparison of user experience in the current setting with other settings that may demand slightly different forms of peripheral awareness and engaged interaction. It will also encourage the connection between museological expertise in the field of informal learning with the development of mixed reality technology for museum environments.

Additionally, findings of this research can be further extended to substantiate research in the role of sociality in remote museum visiting. This strand of museological research is currently emerging and is pursued by museum institutions, as opposed to academic research groups, with focus on both asynchronous and synchronous social interaction among remote museum visitors. For example, in the History Browser (in progress) on the website of the National Museum of Australia, one can see other people's pathways through the collections or chat with other web visitors about artefacts (Peacock, Ellis et al. 2004). Further exploration of social interaction among distributed companions may contribute towards understanding of remote museum communities and their characteristics. It may also support the shift of the current museum communication model online (Tuer 2000), to include dialogue not only between the museum and its remote visitors but also among remote visitors and among local and remote counterparts.

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[26] STEM stands for Students and Teachers Educational Material. In this project, the Science Museum invited students and teachers to create online resources related to aspects of the museum's exhibitions.

9.4 On the finishing line

This research and this thesis has been a practice of weaving together multiple disciplines, people and processes. The ideas and the phenomena that underlie and support this work were often socially negotiated, produced and organised in a series of meetings, data sessions, discussions and personal investigations. My final job was to organise the diverse material, the wealth of information, the comments of my reviewers and my personal opinions and interests into one coherent story that would offer an insider's view to museum co–visiting for a range of diverse audiences. The task, therefore, was to balance a museologically trained intuition with a newly acquired understanding of ethnomethodology, conversation analysis and technological design. This marriage of ideas and levels of expertise is evident throughout this thesis. Furthermore, the enthusiasm about the potential use of the technology in museum visiting had to be tamed by research–driven critical investigation that would lead to understanding and support further research.

At the end of this process, I firmly believe that casual group museum visiting, viewing and making sense of artefacts, interacting with companions and museum settings are deeply social activities that are continuously negotiated and shaped through companions' conduct. Therefore, research that looks at the potential support of sociality in remote visits may prove beneficial for the development of rewarding remote and distributed museum visits. On the other hand, museum settings may offer to technological investigation the opportunity to expand the understanding of the use of technologies in aspects of everyday life that go beyond the current research interest in work into motivational leisure activities.

Bibliography

Abu-Shumays, M. and G. Leinhardt (2000). Two docents in three museums: A study of central and peripheral participation. Technical Report MLC-02. Learning Research & Development Center, University of Pittsburgh.

Ackerman, M. S., D. Hindus, S. D. Mainwaring and B. Starr (1997). Hanging on the 'wire: A field study of an audio-only media space. *ACM Transactions on Computer-Human Interaction* **4**(1): 39-66.

Adler, A. and A. Henderson (1994). A room of our own: Experiences from a direct office share. In *Proceedings of CHI'94*, ACM Press. 138-144.

AMOL-Australian Museums & Galleries Online Assist in maintaining public areas (training for the collections sector). Available on: http://amol.org.au/training/ (30/09/04).

Anderson, B. (1997). Work, ethnography and system design. In *The encyclopedia of microcomputers*. A. Kent and J. G. Williams (eds). New York, Marcel Dekker. 159-183.

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. In *Proceedings of CHI'02*, ACM Press. 431-438.

Aoki, P. M. and A. Woodruff (2000). Improving electronic guidebook interfaces using a task-oriented design approach. In *Proceedings of DIS'00*, ACM Press. 319-325.

Baillie, A. (1996). Empowering the visitor: The family experience of museums. A pilot study of ten family group visits to the Queensland museum. Available on: http://amol.org.au/evrsig/lib_papers/baillie96.pdf (12/08/04).

Bandura, A. and R. Walters (1963). *Social learning and personality development*. New York, Holt, Rinehart and Winston.

Bannon, L. J. (2000). Situating workplace studies within the human-computer interaction field. In *Workplace studies: Recovering work practice and informing system design*. P. Luff, J. Hindmarsh and C. Heath (eds). Cambridge, Cambridge University Press. 230-241.

Bannon, L. J. and S. Bødker (1997). Constructing common information spaces. In *Proceedings of ECSCW'97*, Kluwer Academic Publishers. 81-96.

Bannon, L. J. and K. Schmidt (1991). CSCW: Four characters in search of a context. In *Studies in computer supported cooperative work: Theory, practice and design*. J. Bowers and S. Benford (eds). Amsterdam. 3-16.

Barbieri, T. and P. Paolini (2000). Cooperative visits for museum www sites a year later: Evaluating the effect. In *Museums and the Web 2002*, Archives & Museum Informatics.

Baxandall, M. (1987). *Patterns of intention: On the historical explanation of pictures*. New Haven, Yale University Press.

Bell, G. (2002). Making sense of museums: The museum as "cultural ecology". Technical Report. Intel Corporation.

Bellotti, F., R. Berta, A. d. Gloria, E. Ferretti and M. Margarone (2003). VeGame: Exploring art and history in Venice. *IEEE Computer* **36**(9): 48-55.

Benford, S., M. Flintham, A. Drozd, R. Anastasi, D. Rowland, N. Tandavanitj, M. Adams, J. Row-Farr, A. Oldroyd and J. Sutton (2004). Uncle Roy all around you: Implicating the city in a location-bases performance. In *Presented in ACE2004*, ACM Press.

Benford, S., C. Greenhalgh, M. Craven, G. Walker, T. Regan, J. Morphett, J. Wyver and J. Bowers (1999). Broadcasting on-line social interaction as inhabited television. In *Proceedings of ECSCW'99*, Kluwer. 179-189.

Benford, S., C. Greenhalgh, G. Reynard, C. Brown and B. Koleva (1998). Understanding and constructing shared spaces with mixed reality boundaries. *ACM Transactions on Computer-Human Interaction* **5**(3): 185-223.

Benford, S., G. Reynard, C. Greenhalgh, D. Snowdon and A. Bullock (2000). A poetry performance in a collaborative virtual environment. *IEEE Computer Graphics and Applications* (May/June): 66-75.

Bentley, R., J. A. Hughes, D. Randall, T. Rodden, P. Sawyer, D. Shapiro and I. Sommerville (1992). Ethnographically-informed system design for air traffic control. In *Proceedings of CSCW'92*, ACM Press. 123-129.

Billinghurst, M., S. Bee, J. Bowskill and H. Kato (1999). Asymmetries in collaborative wearable interfaces. In *Proceedings of the 3rd International Symposium on Wearable Computers*, IEEE Computer Society. 134-140.

Bitgood, S. (1994). Designing effective exhibits: Criteria for success, exhibit design approaches, and research strategies. *Visitor Behavior* **IX**(4): 4-15.

Bitgood, S. (2002). Environmental psychology in museums, zoos, and other exhibition centers. In *Handbook of environmental psychology*. R. Bechtel and A. Churchman (eds), John Wiley & Sons. 461-480.

Björk, S., J. Falk, R. Hansson and P. Ljungstrand (2001). Pirates! Using the physical world as a game board. In *Proceedings of Interact 2001*.

Blud, L. M. (1990). Sons and daughters: Observations on the way families interact during a museum visit. *Museum Management and Curatorship* **1990**(9): 257-264.

Bly, S. A., S. R. Harrison and S. Irwin (1993). Media spaces: Bringing people together in a video, audio and computing environment. Communications of the ACM. **36:** 27-46.

Borysewicz, S. (1998). Networked media: The experience is closer than you think. In *The virtual and the real: Media in the museum*. S. Thomas and A. Mintz (eds). Washington, American Association of Museums. 103-117.

Bowers, J., J. O'Brien and J. Pycock (1996). Practically accomplishing immersion: Cooperation in and for virtual environments. In *Proceedings of CSCW'96*, ACM Press. 380-389.

Bradburne, J. (2003). Between a rock and a hard place. Available on: http://www.doorsofperception.com/Features/details/83/ (17/01/05).

Brown, B. and M. Bell (2004). Social interaction in 'there'. In *Extended abstracts of CHI'04*, ACM Press. 1465-1468.

Brown, B. and M. Chalmers (2003). Tourism and mobile technology. In *Proceedings of CSCW'03*, Klewer Academic Press. 335-355.

Brown, B., M. Chalmers, M. Bell, I. MacColl, M. Hall and P. Rudman (2005). Sharing the square: Collaborative visiting in the city streets. In *Proceedings of CHI'05, alt.chi*, ACM Press.

Brown, B., I. MacColl, M. Chalmers, A. Galani, C. Randell and A. Steed (2003). Lessons from the lighthouse: Collaboration in a shared mixed reality system. In *Proceedings of CHI'03*, ACM Press. 577-584.

Buddensieg, A. (2002). Personal communication via e-mail (21/11/2002).

Büscher, M., J. Hughes, J. Trevor, T. Rodden and J. O'Brien (1999). Supporting cooperation across shared virtual environment. In *Proceedings of GROUP'99*, ACM Press. 61-70.

Büscher, M., G. Kramp and P. G. Krogh (2003). In formation: Support for flexibility, mobility, collaboration and coherence. *Personal and Ubiquitous Computing* **7**: 136-146.

Büscher, M., J. O'Brien, T. Rodden and J. Trevor (2001). "He's behind you": The experience of presence in shared virtual environments. In *Collaborative virtual environments: Digital places and spaces for interaction*. E. F. Churchill, D. N. Snowdon and A. J. Munro (eds). London, Springer. 77-98.

Button, G. (2000). The ethnographic tradition and design. *Design Studies* **21**(4): 319-332.

Cameron, D. F. (1971). The museum, a temple or the forum. *Curator* **XIV**(1): 11-24.

Capital Bicycle Club (2003). Capita bicycle club Saturday social rides 2003. Available on: http://www.capitalbicycleclub.org/cbcsocialrides2003.pdf (03/01/04).

Chalmers, M. (2003). City: A mixture of old and new media. In *Inhabited information spaces*. E. Churchill, D. Snowdon and E. Frecon (eds). Heidelberg, Springer Verlag. to be published.

Chalmers, M., M. Bell, B. Brown, M. Hall, S. Sherwood and P. Tennent (2005). Gaming on the edge: Using seams in Ubicomp games. In *ACE 2005*, ACM.

Chalmers, M. and A. Galani (2004). Seamful interweaving: Heterogeneity in the theory and design of interactive systems. In *Proceedings of DIS'04*, ACM Press. 243-252.

Chandwick, J. (1999). A survey of characteristics and patterns of behavior in visitors to a museum web site. In *Proceedings of Museums and the Web 1999*, Archives & Museum Informatics. Electronic version.

Churchill, E. F., D. N. Snowdon and A. J. Munro (eds) (2001). *Collaborative virtual environments: Digital places and spaces for interaction*. London, Springer.

Ciolfi, L. and L. J. Bannon (2001). Technologies in public places. In *Interaction as a public phenomenon. SHAPE project, deliverable 2.1*. London, SHAPE project. 24-42.

Clement, A. (1990). Cooperative work for computer work: A social perspective on the empowering of end users. In *Proceedings of CSCW'90*, ACM Press. 223-236.

Combs, A. A. (1999). Why do they come? Listening to visitors at a decorative arts museum. *Curator* **43**(2): 186-197.

Communications Design Team, R. O. M. (1999). Spatial considerations. In *The educational role of the museum*. E. Hooper-Greenhill (ed.). London, New York, Routledge. 178-190.
Crabtree, A. (2003). *Designing collaborative systems: A practical guide to ethnography*. London, Berlin, Springer.
Crabtree, A. (2004a). Design in the absence of practice: Breaching experiments. In *Proceedings of DIS'04*, ACM Press. 59-68.
Crabtree, A. (2004b). Understanding the social life of Uncle Roy: Field report. Technical Report. University of Nottingham, Mixed Reality Lab.
Crabtree, A., D. M. Nichols, J. O'Brien, M. Rouncefield and M. B. Twidale (1998). The contribution of ethnomethodologically-informed ethnography to the progress of designing digital libraries. Technical report CSEG/5/98. Lancaster University.
Crowley, K. and M. A. Callanan (1998). Describing and supporting collaborative scientific thinking in parent-child interactions. *Journal of Museum Education* **17**(1): 12-17.
Cunliffe, D., E. Kritou and D. Tudhope (2001). Usability evaluation for museum web sites. *Museum Management and Curatorship* **19**(3): 229-252.
Davies, S. (1994). A sense of purpose: Rethinking museum values and strategies. In *Museum provision and professionalism*. G. Kavanagh (ed.). London, Routledge. 33-39.
DCMS (Department of Culture Media and Sport) (2000). Centres for social change: Museums, galleries and archives for all: Policy guidance on social inclusion for DCMS funded and local authority museums, galleries and archives in england. DCMS.
DCMS (Department of Culture Media and Sport) (2001). Libraries, museums, galleries and archives for all: Co-operating across the sectors to tackle social exclusion. DCMS.
Di Blas, N., P. Paolini and S. Hazan (2003). The SEE experience: Edutainment in 3D virtual worlds. In *Proceedings of the Museums and the Web 2003*, Archives & Museums Informatics.
Diamond, J. (1986). The behaviour of family groups in science museums. *Curator* **29**(2): 139-154.
Dierking, L. D. (1998). Interpretation as a social experience. In *Contemporary issues in heritage and environmental interpretation: Problems and prospects*. D. Uzzell and R. Ballantyne (eds). London, The Stationery Office. 56-76.
Dierking, L. D., J. J. Luke, K. A. Foat and L. Adelman (2001). The family and free choice learning. *Museum News* **38** (November/December): 38-43, 67-69.
Dix, A. (1992). Pace and interaction. In *Proceedings of HCI'92*, Cambridge University Press. 193-207.
Doering, Z. D. (1999). Strangers, guest or clients? Visitor experiences in museums. Technical Report. Smithsonian Institution.
Dourish, P. (2001). *Where the action is*. Cambridge, Massachusetts, The MIT Press.
Dourish, P., A. Adler, V. Bellotti and A. Henderson (1996). Your place or mine? Learning from long-term use of audio-video communication. *Journal of Computer Supported Cooperative Work* **5**(1): 33-62.

Dourish, P. and V. Bellotti (1992). Awareness and coordination in shared workspaces. In *Proceedings of CSCW'92*, ACM Press. 107-114.
Dourish, P. and S. A. Bly (1992). Portholes: Supporting awareness in a distributed work group. In *Proceedings of CHI'92*, ACM Press. 541-547.
Draper, L. L. (1984). Friendship and the museum experience: The interrelationship of social ties and learning. Unpublished PhD thesis. University of California, Berkeley.
Economou, D., W. Mitchell and S. Pettifer (2001). User centred virtual actor technology. In *Proceedings of Virtual Reality, Archaeology, and Cultural Heritage (VAST)*, ACM Press. 323-332.
Edwards, K. W. (1994). Session management for collaborative applications. In *Proceedings CSCW'94*, ACM Press. 323-330.
Exploratorium (2001). Electronic guidebook forum. Technical Report. Exploratorium.
Falk, J. H. (1998). Visitors: Who does, who doesn't and why. *Museum News*(March/April): 38-43.
Falk, J. H. and L. D. Dierking (1992). *The museum experience*. Washington, D.C., Whalesback Books.
Falk, J. H., J. J. Koran, L. D. Dierking and L. Dreblow (1985). Predicting visitor behavior. *Curator* **28**(4): 249-257.
Filippini-Fantoni, S. (2003). Museums with a personal touch. In *Proceedings of EVA 2003*. 1-10.
Fitzpatrick, G. and S. Kaplan (1997). Designing support for remote intensive-care telehealth using the locales framework. In *Proceedings of DIS'97*, ACM Press. 173-185.
Fleck, M., M. Frid, T. Kindberg, E. O'Brien-Strain, R. Rajani and M. Spasojevic (2002). From informing to remembering: Ubiquitous systems in interactive museums. *Pervasive Computing* (April-June): 13-21.
Flintham, M. (2004). Painting the town red: A tool for location-based game design. Technical Report. University of Nottingham.
Flintham, M., S. Benford, R. Anastasi, T. Hemmings, A. Crabtree, C. Greenhalgh, N. Tandavanitj, M. Adams and J. Row-Farr (2003). Where on-line meets on the streets: Experiences with mobile mixed reality games. In *Proceedings of CHI'03*, ACM Press. 569-576.
Fraser, M. (2000). Working with objects in collaborative virtual environments. Unpublished PhD Thesis. University of Nottingham, Nottingham, UK.
Galani, A. and M. Chalmers (2002). Can you see me? Exploring co-visiting between physical and virtual visitors. In *Proceedings of Museums and the Web 2002*, Archives & Museum Informatics. 31-40.
Garfinkel, H. (1967). *Studies in ethnomethodology*. Cambridge, Polity Press.
Gaver, W. W. (1992). The affordances of media spaces for collaboration. In *Proceedings of CSCW'92*, ACM Press. 17-24.
Gaver, W. W., T. Moran, A. MacLean, L. Lövstrand, P. Dourish, K. Carter and W. Buxton (1992). Realizing a video environment: Europarc's RAVE system. In *Proceedings of CHI'92*, ACM Press. 27-35.

Gilbert, J. K. and M. Priest (1996). *The exhibition 'Put yourself in the picture', National Portrait Gallery, 14 July - 29 October 1995.* Reading, The New Bulmershe Papers.
Goffman, E. (1966). *Behavior in public places: Notes on the social organization of gatherings*. New York; London, The Free Press.
Goffman, E. (1969). *The presentation of self in everyday life*. London, Allen Lane The Penguin Press.
Goffman, E. (1971). *Relations in public: Microstudies of the public order*, Basic Books.
Goffman, E. (1981). *Forms of talk*. Philadelphia, University of Pennsylvania Press.
Goldman, K. H. and D. Schaller (2004). Exploring motivational factors and visitor satisfaction in on-line museum visits. Archives & Museum Informatics, Arlington, Virginia.
Goodwin, C. and M. H. Goodwin (1996). Seeing as situated activity: Formulating planes. In *Cognition and communication at work*. Y. Engeström and D. Middleton (eds). Cambridge, Cambridge University Press. 61-95.
Gutwin, C., S. Greenberg and M. Roseman (1996). Workspace awareness in real-time distributed groupware: Framework, widgets, and evaluation. In *Proceedings of HCI'96*, Springer Verlag. 281-298.
Halloran, J., Y. Rogers and G. Fitzpatrick (2003). From text to talk: Multiplayer games and voiceover IP. In *Proceedings of Level Up: First International Digital Games Conference*, DIGRA. 130-142.
Hammersley, M. (1992). *What's wrong with ethnography? Methodological explorations*. London, New York, Routledge.
Hammersley, M. and P. Atkinson (2000). *Ethnography: Principles in practice*. London, New York, Routledge.
Harper, R. H. R. (2000). The organisation in ethnography: A discussion of ethnographic fieldwork programs in CSCW. *Journal of Computer Supported Cooperative Work* **9**(2): 239-264.
Harper, R. H. R. and J. A. Hughes (1993). "What a f-ing system! Send 'em all to the same place and then expect us to stop 'em hitting": Making technology work in air traffic control. In *Technology in working order: Studies of work, interaction, and technology*. G. Button (ed.). London, Routledge. 127-144.
Harr, R. (2002). Exploring the concept of group interaction through action in a mobile context. In *Proceedings of DEXA 2002*, Springer-Verlag. 567-576.
Hartswood, M. and R. Proctor (2000). Design guidelines for dealing with breakdowns and repairs in collaborative work settings. *International Journal of Human-Computer Studies* **53**(1): 91-120.
Hatala, M., L. Kalantari, R. Wakkary and K. Newby (2004). Ontology and rule based retrieval of sound objects in augmented audio reality system for museum visitors. In *Proceedings of ACM Symposium on Applied Computing*, ACM Press. 1045-1050.
Have, P. T. (2002). The notion of member is the heart of the matter: On the role of membership knowledge in ethnomethodological inquiry [53 paragraphs]. *Forum: Qualitative Social Research [On-line Journal]* **3**(3): http://www.qualitative-research.net/fqs/fqs-eng.htm.

Hazan, S. (2001). The virtual aura - is there space for enchantment in a technological world? In *Proceedings of Museums and the Web 2001*, Archives & Museum Informatics. http://www.archimuse.com/mw2001/papers/hazan/hazan.html.

Heath, C. (1984). Talk and recipiency: Sequential organization in speech and body movement. In *Structures of social action*. M. J. Atkinson and J. Heritage (eds). Cambridge, Cambridge University Press. 247-265.

Heath, C. and J. Hindmarsh (2000). Configuring action in objects: From mutual space to media space. *Mind, Culture, and Activity* **7**(1&2): 81-104.

Heath, C. and P. Luff (1991a). Collaborative activity and technological design: Task coordination in London underground control rooms. In *Proceedings of ECSCW'91*, Kluwer. 65-80.

Heath, C. and P. Luff (1991b). Disembodied conduct: Communication through video in a multi-media office environment. In *Proceedings of CHI'91*, ACM Press. 99-103.

Heath, C. and P. Luff (1992a). Media space and communicative asymmetries: Preliminary observations of video mediated interaction. *Human Computer Interaction* 7: 315-346.

Heath, C. and P. Luff (2000). *Technology in action*. Cambridge, Cambridge University Press.

Heath, C., P. Luff, D. vom Lehn, J. Hindmarsh and J. Cleverly (2002). Crafting participation: Designing ecologies, configuring experience. *Visual Communication* **1**(1): 9-33.

Heath, C., M. Sanches Svensson, J. Hindmarsh, P. Luff and D. vom Lehn (2002). Configuring awareness. *Journal of Computer Supported Cooperative Work* **11**(3-4): 317-347.

Heath, C. and D. vom Lehn (2002). Misconstruing interaction. In *Proceedings of Interactive Learning in Museums of Art and Design*, Vicrotia and Albert Museum. http://www.vam.ac.uk/res_cons/research/learning/.

Heath, C. C. and P. K. Luff (1992b). Explicating face to face interaction. In *Researching social life*. N. Gilbert (ed.). London, Sage. 306-327.

Hein, G. E. (1998). *Learning in the museum*. London, New York, Routledge.

Hein, H. S. (2000). *The museum in transition: A philosophical perspective*. Washington; London, Smithsonian Institution Press.

Hemmings, T., D. Randall, D. Francis and L. Marr (2001). Bollock daggers and kidney daggers: An ethnography of classification work in museums. *TeamEthno-Online*(1): Digital publication. http://www.teamethno-online.org.

Hemmings, T., D. Randall, D. Francis, L. Marr, C. Divall and G. Porter (1997). Situated knowledge and the virtual science and industry museum: Problems in the social-technical interface. In *Proceedings of Museums and the Web 1997*, Archives & Museum Informatics.

Hencke, D. (1999). Museum slated over parties with the marbles. The Guardian 8/11/2004.

Hensel, K. A. (1987). Families in a museum: Interactions and conversations at displays. Unpublished PhD thesis. Columbia University.

Heritage, J. (1984). *Garfinkel and ethnomethodology*. Cambridge, Polity Press.

Hershman, L. The difference engine #3, 1995-1998 A.D. Available on: http://www.lynnhershman.com/investigations/surveillance/de3/de3.html (17/01/03).

Hindmarsh, J. (2002). Creating assemblies: Aboard the *Ghost Ship*. In *Proceedings of CSCW'02*, ACM Press. 156-165.

Hindmarsh, J. (eds) (2003). *Designing room-sized public experiences. SHAPE project - deliverable 2.2*. London, SHAPE project.

Hindmarsh, J., M. Fraser, C. Heath and S. Benford (2001). Virtually missing the point: Configuring CVES for object-focused interaction. In. E. F. Churchill, D. N. Snowdon and A. J. Munro (eds). Collaborative virtual environments: digital places and spaces for interaction, Springer. 115-139.

Hindmarsh, J., M. Fraser, C. Heath, S. Benford and C. Greenhalgh (1998). Fragmented interaction: Establishing mutual orientation in virtual environments. In *Proceedings of CSCW'98*, ACM Press. 217-226.

Hindmarsh, J. and C. Heath (2000). Sharing the tools of the trade. *Journal of Contemporary Ethnography* **29**(5): 523-562.

Hindmarsh, J. and A. Pilnick (2002). The tacit order of teamwork: Collaboration and embodied conduct in anesthesia. *The Sociological Quarterly* **43**(2): 139-164.

Hood, M. G. (1983). Staying away: Why people choose not to visit museums. *Museum News* **1983**(April): 50-56.

Hughes, J., V. King, T. Rodden and H. Andersen (1994). Moving out from the control room: Ethnography in system design. In *Proceedings of CSCW'94*, ACM Press. 429-439.

Hutchins, E. (1995). *Cognition in the wild*. Cambridge, Massachusetts, MIT Press.

Jaffe, J. and S. Feldstein (1970). *Rhythms of dialogue*. New York, London, Academic Press.

Japanese Museum Information (1998). The world wide museum survey on the web. Available on: http://www.museum.or.jp/IM_english/f-survey.html (13/01/03).

Jordan, B. and A. Henderson (1995). Interaction analysis: Foundations and practice. *The Journal of the Learning Sciences* **4**(1): 39-103.

Kendon, A. (1990). *Conducting interaction: Patterns of behavior in focused encounters*. Cambridge, Cambridge University Press.

Koleva, B., H. Schnädelbach, S. Benford and C. Greenhalgh (2001). Experiencing a presentation through a mixed reality boundary. In *Proceedings of GROUP'01*, ACM Press. 71-80.

Koran, J. J., M. L. Koran, J. Foster and L. D. Dierking (1988). Using modeling to direct attention. *Curator* **31**(1): 36-42.

Kravchyna, V. and S. K. Hastings (2002). Informational value of museum web sites. *First Monday* **7**(2): Electronic Journal.

Kristoffersen, S. and F. Ljungberg (1999). An empirical study of how people establish interaction: Implications for CSCW session management model. In *Proceedings of CHI'99*, ACM Press. 1-8.

Kruppa, M., A. Krüger, C. Rocchi, O. Stock and M. Zancarano (2003). Seamless personalized TV-like presentations on mobile and stationary

devices in a museum. In *Proceedings of ICHIM'03*, Archives & Museum Informatics. Electronic Edition.
Lamarche, H. (1995). The audioguide as an aid to understanding an exhibition. In *Text in the exhibition medium*. A. Blais (ed.). Québec City, La Société des Musées Québécois, Musée de la Civilisation. 180-188.
Laurier, E., A. Whyte and K. Buckner (2001). An ethnography of a neighbourhood café: Informality, table arrangements and background noise. *Mundane Behavior* **2**(2): 195-232.
Law, J. and J. Hassard (eds) (1999). *Actor network theory and after*. Oxford, Blackwell.
Leinhardt, G. and K. Crowley (1998). Museum learning as conversational elaboration: A proposal for capture, code and analyze talk in museums. Technical report MLC-01. Learning Research & Development Centrer, University of Pittsburgh.
Leinhardt, G. and K. Crowley (2002). Objects of learning, objects of talk: Changing minds in museums. In *Multiple perspectives on children's object-centered learning*. S. Paris (ed.). Mahwah, NJ, USA, Lawrence Erlbaum Associates.
Leinhardt, G. and K. Knutson (2004). *Listening in on museum conversations*. Walnut Creek, Altamira Press.
Leinhardt, G., K. Knutson and K. Crowley (2003). Museum learning collaborative redux. *Journal of Museum Education* **28**(1): 23-31.
Levasseur, M. and E. Véron (1983). *Ethnographie de l'exposition*. Paris, Centre Georges Pompidou, Bibliothèque publique d'information.
Ling, R. (1997). 'One can talk about common manners!': The use of mobile telephones in inappropriate situations. In *Themes in mobile telephony. Final report of the COST 248 Home and Work group*.
Livingston, E. (1987). *Making sense of ethnomethodology*. London, Routledge and Kegan Paul.
Loomis, R. J., S. M. Elias and M. Wells (2003). Website availability and visitor motivation: An evaluation study for the Colorado digitization project. Available on: http://www.cdpheritage.org/resource/reports/loomis_report.pdf (13/08/04).
Lord, M. (1999). Editorial. *Museum International* **51**(4): 3.
Luff, P., J. Hindmarsh and C. Heath (eds) (2000). *Workplace studies: Recovering work practice and informing system design*. Cambridge, Cambridge University Press.
MacColl, I., D. Millard, C. Randell, A. Steed and et al. (2002). Shared visiting in Equator city. In *Proceedings of CVE'02*, ACM Press. 88-94.
MacDonald, S. (2002). *Behind the scenes at the science museum*. Oxford; New York, Berg.
Mantei, M. M., R. M. Baecker, A. J. Sellen, W. Buxton, T. Milligan and B. Wellman (1991). Experience in the use of a media space. In *Proceedings of CHI'91*, ACM Press. 203-208.
Marti, P. (2001). Design for art and leisure. In *Proceedings of ICHIM'01*, Archives & Museum Informatics. 387-397.
Martin, D. (2000). Audio guides. *Museum Practice* **5**(1): 71-81.

McManus, P. M. (1987). Communication with and between visitors to a science museum. Unpublished PhD thesis. Kings College London, London.
McManus, P. M. (1989). Oh yes, they do: How museum visitors read labels and interact with exhibit texts. *Curator* **32**(3): 174-189.
McManus, P. M. (1991). Making sense of exhibits. In *Museum languages: Objects and texts*. G. Kavanagh (ed.). Leicester, Leicester University Press. 35-46.
Melton, A. W. (1935). Problems of installation in museums of art. New Series. Number 14. American Association of Museums.
Millen, D. R. (2000). Rapid ethnography: Time deepening strategies for hci field research. In *Proceedings of DIS'00*, ACM Press. 280-286.
Mintz, A. (1998). Media and museums: A museum perspective. In *The virtual and the real: Media in the museum*. S. Thomas and A. Mintz (eds). Washington, D.C., American Association of Museums. 19-35.
MORI (2001). Visitors to museums and galleries in the UK. Research study conducted for resource: The Council for Museums, Archives and Libraries. Technical Report.
Moussouri, T. (1997). Family agendas and family learning in hands-on museums. Unpublished PhD Thesis. University of Leicester, Leicester.
Muller, K. (2002). Digital watch. *Museums Journal* **October 2002**: 27-29.
Murtagh, G. M. (2002). Seeing the "rules": Preliminary observations of action, interaction and mobile phone use. In *Wireless world: Social and interactional aspects of the mobile age*. B. Brown, N. Green and R. H. R. Harper (eds). London, Springer. 81-91.
Nardi, B. A. (eds) (1996). *Context and consciousness: Activity theory and human computer interaction*. Cambridge, Massachusetts, The MIT Press.
Nicholas, H. The art and science of wayfinding. *Access by Design*(85): 5-7.
Nielsen, R. (2002). Collaborative spaces: Inhabited virtual 3d worlds. In *Virtual space: Spatiality in virtual inhabited 3D worlds*. L. Qvortrup (ed.). London, Springer. 171-189.
Nilsson, A., I. Heldal, A.-S. Axelsson and R. Schroeder (2002). The long-term uses of shared virtual environments: An exploratory study. In *The social life of avatars: Presence and interaction in shared virtual environments*. R. Schroeder (ed.). London, Springer. 112-126.
Nilsson, S., L. Svensson, F. Bengtsson and C. Johansson (2003). Exploring awareware. In *Proceedings of IRIS 23*, IRIS. 1019-1029.
Not, E., D. Petrelli, O. Stock, C. Strapparava and M. Zancanaro (1997). Person-oriented guided visits in a physical museum. In *Proceedings of ICHIM'97*.
Olson, J. S., G. M. Olson, M. Storrøsten and M. Carter (1992). How a group-editor changes the character of a design meeting as well as its outcome. In *Proceedings of CSCW'92*, ACM Press. 91-98.
Orr, J. E. (1996). *Talking about machines: An ethnography of a modern job*. Ithaca, London, Cornell University Press.
Oxford English Dictionary Online (2001) ed. by J.A. Simpson and E.S.C. Weiner. Available on: http://dictionary.oed.com/ (20/09/04).

Packer, J. and R. Ballantyne (2004). Solitary vs. Shared learning: Exploring the social dimensions of museum learning. Available on: http://www.museumsaustralia.org.au/conference/ (13/08/04).
Peacock, D., D. Ellis and J. Doolan (2004). Searching for meaning: Not just records. In *Proceedings of Museums and the Web 2004*, Archives & Museum Informatics. http://www.archimuse.com/mw2004/papers/peacock/peacock.html.
Perry, D., L. Roberts, K. Morrissey and L. H. Silverman (1996). Listening outside and within. *Journal of Museum Education* (Fall): 26-27.
Petrelli, D., A. De Angeli and G. Convertino (1998). Analysing visiting preferences and behaviour in natural history museums. Technical Report. IRST.
Pettifer, S., A. West, A. Crabtree and C. Murray (1999). Designing shared virtual environments for social interaction. In *Proceedings of the 3rd workshop on Human Computer Interaction*. 12-26.
Psarra, S., T. Grajewski and M. O'Neill (2002). Rethinking museum design - the effect of layout on visitors patterns of movement and use. *Museum Practice* (March).
Rabinovitch, V. and S. Alsford (2002). Museums and the Internet: Reflections on eight years of Canadian experience. Available on: http://www.civilization.ca/academ/articles/rabi_01e.html (13/08/04).
Randell, C. and H. L. Muller (2001). Low cost indoor positioning system. In *Proceedings of Ubicomp 2001*, Springer. 42-48.
Randell, C. and H. L. Muller (2002). The well mannered wearable computer. *Personal and Ubiquitous Computing* **6**(1): 31-36.
Randell, R. (2004a). Accountability in an alarming environment. In *Proceedings of CSCW'04*, ACM Press. 125-131.
Randell, R. (2004b). 'I just took it all apart': An ethnographic study of accountability and the use of technology within the intensive care unit. Unpublished PhD Thesis. University of Glasgow, Glasgow.
Re:source (2000). Renaissance in the regions: A new vision for England's museums. Technical Report. Council for Museums, Archives and Libraries.
Reynolds, R. (1997). Museums and the Internet : What purpose should the information supplied by museums on the world wide web serve? Unpublished MSc Dissertation. University of Leicester, Leicester.
Ruhleder, K. (2000). The virtual ethnographer: Fieldwork in distributed electronic environments. *Field Methods* **12**(1): 3-17.
Ruhleder, K. and B. Jordan (2001). Co-constructing non-mutual realities: Delay generated trouble in distributed interaction. *Journal of Computer Supported Cooperative Work* **10**(1): 113-138.
Ryave, L. A. and J. N. Schenkein (1974). Notes on the art of walking. In *Ethnomethodology: Selected readings*. R. Turner (ed.). New York, Penguin Education. 265-278.
Sacks, H. (1984). Notes on ethnomethodology. In *Structures of social action: Studies in conversation analysis*. M. J. Atkinson and J. Heritage (eds). Cambridge, Cambridge University Press. 21-27.
Sacks, H. (1998). *Lectures on conversation*. Oxford, Blackwell.

Sacks, H., E. A. Schegloff and G. Jefferson (1974). A simplest systematics for the organization of turn-taking for conversation. *Language* **50**(4): 696-735.

Schegloff, E. (1972). Notes on a conversational practice: Formulating place. In *Studies in social interaction*. D. N. Sudnow (ed.). New York, The Free Press. 75-119.

Schmidt, K. (2000). The critical role of workplace studies in CSCW. In *Workplace studies: Recovering work practice and informing design*. C. Heath, J. Hindmarsh and P. Luff (eds). Cambridge, Cambridge University Press. 141-149.

Schmidt, K. and L. J. Bannon (1992). Taking CSCW seriously: Supporting articulation work. *Journal of Computer Supported Cooperative Work* 1(1): 7-40.

Schroeder, R. (eds) (2002). *The social life of avatars: Presence and interaction in shared virtual environments*. London, Springer.

Schubert, K. (2000). *The curator's egg: The evolution of the museum concept from the French revolution to the present day*. London, One-off Press.

Schutz, A. (1970). *On phenomenology and social relations: Selected writings, edited by h. R. Wagner*. Chicago, The University of Chicago Press.

Semper, R., N. Wanner, R. Jackson and M. Bazley (2000). Who's out there? A pilot user study of educational web resources by the science learning network. In *Proceedings of Museums and the Web 2000*, Archives & Museum Informatics.

Serrell, B. (1996). The question of visitor styles. *Visitor Studies: Theory, Research, and Practice* 7(1): 48-53.

Shane, J. (1997). The virtual visit-virtual benefits? In *Proceedings of Here and Now: Contemporary Science and Technology in Museums and Science Centres*, Science Museum. 189-195.

Shapiro, D. (1994). The limits of ethnography: Combining social science for scsw. In *Proceedings of CSCW'94*, ACM Press. 417-428.

Silverman, L. H. (1995). Visitor meaning-making in museums for a new age. *Curator* **38**(3): 161-170.

Smith, J. K. and L. F. Wolf (1996). Museum visitor preferences and intentions in constructing aesthetic experience. *Poetics* **24**(1996): 219-238.

Snowdon, D. N., E. F. Churchill and A. J. Munro (2000). Collaborative virtual environments: Digital spaces and places for CSCW: An introduction. In *Collaborative virtual environments: Digital places and spaces for interaction*. E. F. Churchill, D. N. Snowdon and A. J. Munro (eds). London, Springer. 3-17.

Spalding, J. (2002). *The poetic museum: Reviving historic collections*. London, Prestel.

Sparacino, F. (2002). Real-time sensor-driven understanding of visitors' interests for personalized visually-augmented museum experiences. In *Proceedings of Museums and the Web 2002*, Archives & Museum Informatics. 41-60.

Stanton, D., C. O'Malley, M. Fraser, K. H. Ng and S. Benford (2003). Situating historical events through mixed reality: Adult-child

interactions in the storytent. In *Proceedings of Computer-Supported Collaborative Learning (CSCL'03)*. 293-302.
Stokes-Rees, E. (2003). Methods of a multi-sited study of new national museums: A fieldworker's experience. *Museological Review*(Special issue 10): 67-73.
Stults, R. (1986). Media space. Technical Report. Xerox PARC.
Suchman, L. A. (1987). *Plans and situated action: The problem of human machine communication*. Cambridge, Cambridge University Press.
Thomas, N. and I. Paterson (1998). Science Museum: Web site assessment. Available on: http://www.sciencemuseum.org.uk/eval/rep0.asp (17/01/03).
Thomas, S. (1998). Mediated realities: A media perspective. In *The virtual and the real: Media in the museum*. S. Thomas and A. Mintz (eds). Washington, American Association of Museums. 1-17.
Trahanias, P. E., W. Burgard, D. Haehnel, M. Moors, D. Schulz, H. Baltzakis and A. Argyros (2003). Interactive tele-presence in exhibitions through web-operated robots. In *Proceedings of the 11th International Conference on Advanced Robotics (ICAR)*. 1253-1258.
Tuer, D. (2000). On questions of museum practices and new technologies: Reading Walter Benjamin through the digital lens. *Muse* **XVIII**(2): 20-24.
Twidale, M. B., D. M. Nichols and C. D. Paice (1997). Browsing is a collaborative activity. *Information Processing & Management* **33**(6): 761-783.
Uzzell, D. (1993). Contrasting psychological perspectives on exhibit evaluation. In *Museum visitor studies in the 90s*. S. Bicknell and G. Farmelo (eds). London, Science Museum. 125-129.
Verhoeven, M. (2003). Personal communication: Telephone interview (18/07/2003).
vom Lehn, D. (2002). Exhibiting interaction: Conduct and participation in museums and galleries. Unpublished PhD Thesis. King's College, University of London, London, UK.
vom Lehn, D. and C. Heath (2003). Displacing the object: Mobile technologies and interpretive resources. In *Proceedings of ICHIM'03*, Archives & Museum Informatics. electronic edition.
vom Lehn, D., C. Heath and J. Hindmarsh (2001). Exhibiting interaction: Conduct and collaboration in museums and galleries. *Symbolic Interaction* **24**(2): 189-216.
Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological process*. Cambridge, Massachusetts, Harvard University Press.
Walter, T. (1996). From museum to morgue? Electronic guides in roman bath. *Tourism Management* **17**(4): 241-245.
Watts, P. (2003). Revisiting the 1992 Los Angeles riots: An analysis of geographical perspectives. Unpublished Master's Thesis. Louisiana State University.
Weil, S. E. (2002). *Making museums matter*. Washington, London, Smithsonian Institution Press.

Woodruff, A., M. H. Szymanski, P. M. Aoki and A. Hurst (2001). The conversational role of electronic guidebooks. In *Proceedings of Ubicomp 2001*, Springer. 187-208.
Wright, P. (1989). The quality of visitors' experience in art museums. In *The new museology*. P. Vergo (ed.). London, Reaktion Books. 119-148.
Zimmerman, D. H. and D. Boden (1991). Structure-in-action: An introduction. In *Talk and social structure: Studies in ethnomethodology and conversation analysis*. D. H. Zimmerman and D. Boden (eds). Cambridge, Polity Press.

Appendix 1

Scenarios produced in the initial stage of the *City* project.

Scenario 1 (31 January 2001)
[The initial version of this scenario was a longer text entitled "Tales in the City: Adaptive Information in the Physical City" which enriched the scenario excerpts with further conceptual and theoretical discussion. These parts have been omitted in the version that follows.]
Author: Matthew Chalmers

[...]

Vee
Earlier today, while on the train to Glasgow, Vee used her mobile phone/computer to take a look at tourist information about the city. She read that the physical interior of the home of Charles Rennie Mackintosh, including a good deal of the designer and architect's furniture, has been reassembled in the Hunterian Gallery. She has just walked into this gallery, and is heading for the reconstructed house.

A large map-like display stands in the foyer, showing the layout of the house and some introductory images and descriptions of Mackintosh's work. Vee takes out her mobile, which preloaded the gallery's web page when she walked into the foyer. Using a stylus and the mobile's display, she controls the larger display to better see images of paintings and drawings in the house. On the basis of her browsing, Vee has two of the gallery's guided tours recommended to her. She picks out one of them, agrees to pay the fee, and then puts on her headphones as she steps into the house. In doing so, her mobile is detected and identified by a sensor. This triggers a hidden series of computations and communications: the identification of the mobile's owner, the fee payment, the download of the audio from the gallery's computers to her mobile, the logging of another visitor to the gallery. Vee, however, is not distracted. She just hears a description of the first room, tailored to her interests, position and pace.

The rooms, furniture and other artefacts that Vee sees are complemented by the images, text and audio that form one curator's description of a sequence of paintings and watercolours within the house. A number of pieces are currently in store because of space constraints and restoration work, but Vee is still able to see images and read descriptions of them. She makes a note to come back when the gallery's public inventory shows that a particular gesso panel is on view. While en route to an upper floor, Vee's eye is caught by an unusual high-backed chair. The chair was not highlighted in her tour but, since Vee has been moving around it for a while, the guide automatically offers more information about it. It seems that similar furniture was made for Miss Cranston's Tea Rooms in the city centre. Vee adds this name to a notepad, and tells the tour guide to adjust accordingly.

Along with a record of her progression through the tour and through the building, such actions build up a 'path' that records different places, artefacts and documents of interest to Vee. Her path overlaps with earlier visitors' paths and with other tours, and can be used to offer recommendations of other places to go

and other information to read. As Vee returns to the foyer, she looks at the list of recommendations. It includes the Tea Rooms on Sauchiehall Street, the Mackintosh exhibition in the Lighthouse Centre, a book on the architect, a page on the gesso panel within a web site devoted to Art Nouveau cities across Europe, and a city map. The map shows details of the Tea Rooms and the Lighthouse, as well as public transport options and a walking route into the centre. Choosing the latter option, Vee walks through Kelvingrove Park, occasionally checking her position and route on the map. At a junction, a signpost triggered by the mobile in Vee's pocket briefly flicks up a version of her map and a message: "across the bridge, up the opposite slope and then along Park Circus".

Approaching the city centre, her mobile's map highlights the School of Art and the nearby architectural bookshop. The shop appears to have her previously recommended book in stock, and is offering a reduced price for those on guided tours, but Vee asks for more information about the School. Responding to this, the guide offers a new recommendation: a number of other visitors have formed an informal group and have been looking at Mackintosh buildings. The group hasn't made their location or members' identities known in any detail, but they have posted a note saying that are open to new members, have arranged to meet a professional guide later on at the Lighthouse, and wouldn't mind spreading the cost of the guide. Vee sends a message asking them to get in touch, and a few minutes later they call her back. After a brief chat they invite her to meet them at Miss Cranston's. Time for tea. [...]

A Second (Short) Scenario

The professional guide had finished leading Vee and her companions through the Lighthouse. Vee planned to come back some time soon and so, as she sat in the café, she skimmed back through the route her mobile had tracked over the day. She left a few notes here and there, to remind her of sections worth revisiting, and cut out a few others. She knew some friends would be in the city soon, so she marked a few notes as public.

On the mobile's screen she could see a dense pattern of paths braiding around the building and out into the city. Some were tours as she'd followed before, some had been left by other visitors, and some had been laid down by local artists and writers. These last art pieces could be rather hit and miss, she felt, but she recognised some of the names and checked for reviews. 'The List' magazine gave one tale a good review, so she clicked on it to set it up. Flicking on through the web pages of the magazine took her to the Cinema section, with times and locations. After booking a ticket, she went on to the Music section and chose some music to listen to. As the audio started up in her headphones, she finished her coffee and then headed out of the building in to the lane.

High above her, the tower of the Lighthouse loomed. The time gazing up at the tower was long enough for the tale to be triggered. Mixed in to her music was an old man's voice, describing one of those dark and stormy nights when murders often seem to happen. Vee turned and saw an image of the old man, projected onto the wall of the building just beside her. Vee decided to follow the story, as it moved off down the lane. [...]

Vee Again

Soho's granite walls echo the sky as evening approaches. Vee doesn't mind the approaching rain, however, as she's going to the cinema to see the latest sweat-flick. Realising she needs cash to buy her refreshments-wireless transfers are fine for tickets and a cola, but the illicit drug trade still depends on paper-she stops by an ATM.

"Frank has made contact with the pilot who lives in Curzon street," the ATM screen reads as she waits for her cash.

Ah hah, she thinks, that means Frank will be able to check whether the pilot really did smuggle Mara in to England as Victor claimed. Thoughts of the movie drop away as she speculates on this development. She's tempted to use the ATM again to see whether it will provide more information. But she knows the Tales Consortium curtailed this after the rash of queue-rage attacks when the system was first introduced. She'll have to find another way.

Boarding a number 19 bus, she starts heading towards Holburn. She scans her pda-phone as she passes the corner to Curzon street. There it is! A short message has appeared, just as she passed. "Victor," it reads, "the consortium knows. Flee at once." The consortium? Who are they? And what's the pilot doing communicating with Victor in the first place?

The thought of donning a sensor suit in an auditorium full of strangers has lost its appeal. She must know more about the latest developments of the Tale, even if she has to travel through all of London. She jumps off the 19 and hurries across the road to the wait for the 52. A number of tourists are waiting, and she hopes this is a sign that the next bus will arrive soon.

The bus shelter's destination board is displaying a strange message when Vee happens to glance at it: "a member of the Consortium is here at this stop." As the last letters disappear from the screen, the regular display innocently reappears. She looks around hastily, half her mind expecting to see a shadowy figure, the other half wondering if anybody else is following the Tale-sometimes its useful to exchange notes. But if anybody has noticed the fleeting message, they give no sign.

Vee decides that she'll have to go to her Portal, the one computer in London on which she can reach the Tale website for clues about the developing situation. As its all the way across town from where she lives, she seldom makes the journey to the internet café where she can find the one computer that has the right hardware IP address to let her on the site. But when the story gets exciting enough, it's worth it. Besides, she's discovered some nice shops and restaurants in the area—it's nice to get new parts of town, she thinks. [...]

—*—

Scenario 2 (working version, 22/05/01)

Author: Areti Galani. (This scenario was subsequently developed and de-constructed by Ian MacColl).

Vee is now in the Lighthouse and she has decided to see the Mack Room along with the rest of the exhibitions. She bought the ticket in the reception on the ground floor and off she went up to the main exhibition hall. After visiting the first floor she gets the escalator to the second floor, where the Mack Room is. On the way up she puts the earpiece on. Approaching the room, the system warns her to have her ticket ready. She walks into the room, shows her ticket to the receptionist and makes a couple of steps. She looks around to adjust to the new environment. The first thing she sees is the small pictures of Mackintosh buildings on her right. She things that this can give her a general idea of how Mackintosh buildings look and she may even manage to find some time to visit some of them later in the day. She picks up the leaflet with the map "hmmm, not many things on Mackintosh in this leaflet but a nice map".

While staying for a few more seconds in front of the panels the system starts introducing Mackintosh's work. It also points out that a written text about Mack and his wife M. Macdonald in on the opposite wall. She stands a bit longer listening to the story and gradually moves towards the end of the room. The system starts lowering the voice.

When she reaches the case with the chair and the cupboard the system introduces the options: "on your right is the entrance to the view tower, in front of you is an original Mack chair and on your left you will find information about most aspects of Mack's work". She likes the chair. She had noticed the chair from the moment she walked into the room. The system tells the story of the chair while Vee walks around the case.

Intrigued by the story she decides to walk left into the main exhibition space. She will go for the view in the end of her visit. When she turns she poses for a moment to decide which direction to follow. This space seems really interesting but complex. At this moment the system takes advantage of the opportunity to tell her that on her right she can have a look at the city map with buildings designed by Mack and other Glaswegian architects.

Vee ignores it and goes straight forward to this model of GSA in front of her. She is amazed by the architecture. She listens to a brief story about the building and she also is informed that the drawers under the model hide the plans of the building. She is looking at them happily when the system informs her that if she is interested, more channels of information are available. She takes out her PDA and she checks the available options: well she can listen to real time sounds from the sculpture studios, she can listen to students' impressions of how it is to work in an authentic building, she can also see some of the paintings children did in their visit in the GSA. Additionally, she can e-mail/text her friends, she can put a bookmark on the building so she can check opening hours and probably visit their webpage when back at home. She decides to listen to some of the students' comments just to take a flavour of living and working in GSA, she taps the screen and she listens. At that point she notices that the video screen above the model shows picture of Mack work. Oh, she definitely needs to tell her friend Anna about this building. She will text her.

While walking away from the GSA model she texts Anna, she also decides to send the URL of the VR model of the Mack room, just in case Anna is in office and wants to have a break.

Bingo! Vee sees casually the model of the house of an Art Lover when her PDA announces that Anna is next to her and she asks permission to speak to her. Vee accepts the call. They spend a couple of seconds exchanging greetings. Anna had heard of Mackintosh before but she did not have the chance to visit Glasgow. They decide to go around the Mack room together. The system frees the sound stream for their discussions and delivers in text mode the rest of the content. Vee enjoys the visit and look occasionally on her PDA's screen. In many of the cases Anna reads aloud comments she likes.

In that last workstation Vee is interested to find more about this blue stripe bedroom. The label on the wall says that the room is reconstructed in the Mac house in the Hunterian Art Gallery. Anna, however, has already clicked on the room. She finds herself in an entirely new environment. Vee does not understand what's happening, she is trying to read this strange story about the Mack house when Anna starts describing the so-called guest room in the Mack house. On her screen can see that Anna is not in the room any more. She asks from her if she can open the drawers in the bed-side tables. Nothing interesting there! Some other visitors in the virtual Mack house inform Anna that she can also try the chairs in the living room downstairs. She will go for it. She thanks Vee for her text message and go to explore the rest of the house.

Vee wishes Anna good luck and turns back heading to the tower, time for fresh air. The system starts speaking to her again, giving hints ant tips about the glass wall on her right. She keeps on walking. Just before she enters the tower the system reminds her to have a quick look in the photo of old Glasgow hanging in front of the window on her left. She glimpses at it and starts climbing the stair. On the top of the tower she feels surprised of the view. She walks around, more visitors enjoy the view chatting happily and pointing out places. She decides to take of her earpiece and just spend some moments looking at Glasgow. She can even see this enormous screen in Buchanan Street: Hey, wait a minute! "Vee, thanks for the trip. Anna", that's her friend.

Returning back to the Mack room she thinks of where else she can go for the rest of the afternoon. She gives a last look back in the room and she walks out. It's time for coffee. She decides to go upstairs to Doocoot café, she gets her coffee and reviewing her visit to the Mack room, she browses the thinks she bookmarked earlier. She also has a look on the recommendations the system makes. She finds that this visit to Princes Square shopping mall across the road that this guy from Edinburgh did the last time he was in Glasgow and had visited the Mack room is not a bad idea. The system informs her that Princes Square hosts some of the posh shops in the area; she will go window-shopping! She finishes her coffee. She leaves a brief comment in the on-line visitor book and her address to include her in their mailing list and takes the lift down.

Appendix 2

Sample annotated map from the fieldwork in the Mack Room. This is one of a set of three maps produced for this specific couple.

Lines indicate the route; arrows indicate the direction; the location of arrows indicates stops; longer stops are indicated by a number associated to a description of the activity at that moment, stars (*) indicate meetings among the two participants. Green lines indicate common activity among the participants.

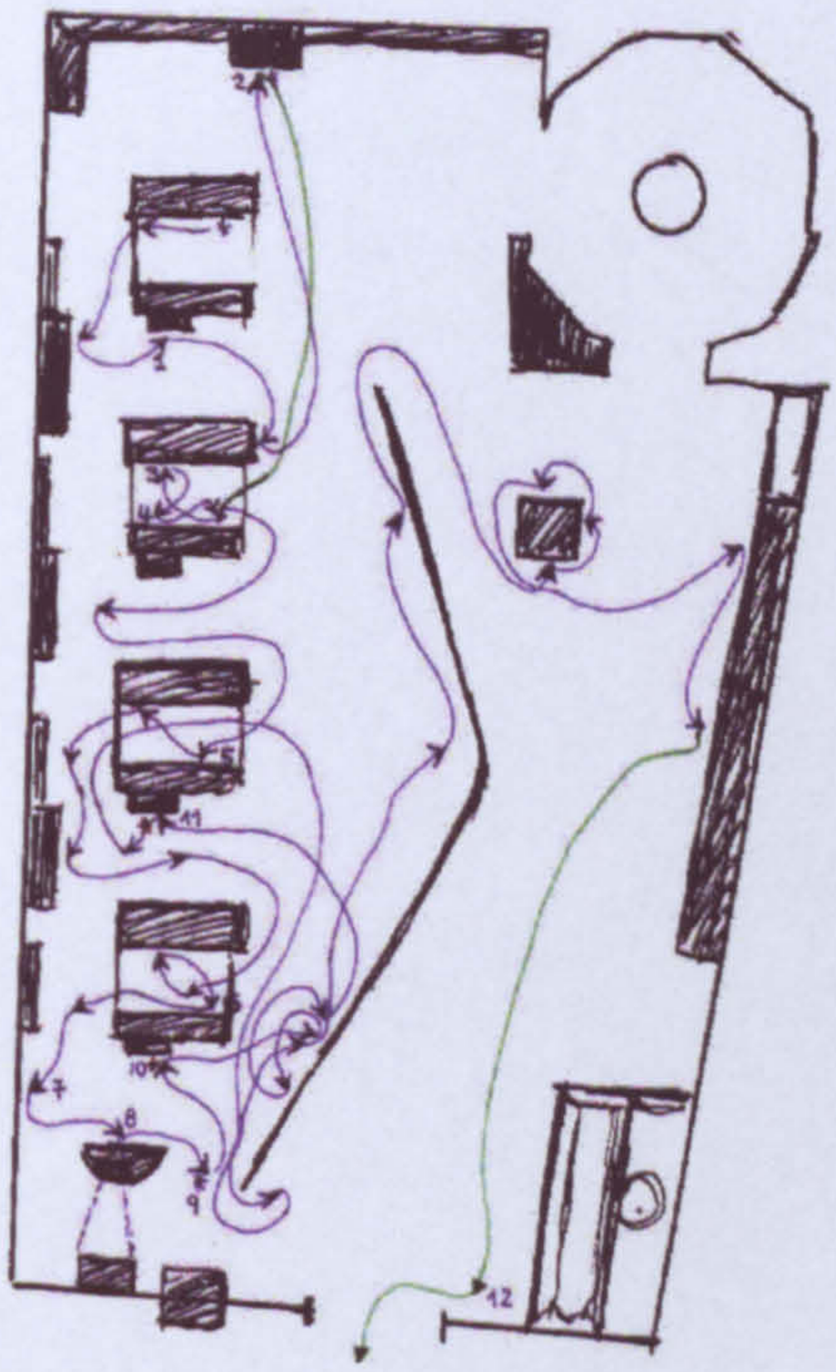
22/10/01

Observer: Areti Galani

1. she plays with the touchscreen.
2.
3. she watches the video.
4. she reads the panel and she goes back to the touchscreen (man still plays with touchscreen).
5. she plays with the touchscreen (man gives her instructions and leaves).
6. she plays with touchscreen (long time).
7. she reads the labels.
8. she watches the oral history video, she checks the chair and then sits on it.
9. she meets up with M, they check the time.

MACK ROOM - THE LIGHTHOUSE

10. She plays with touchscreen after M had started playing
11. She plays with touchscreen after she had watched VP
12. She checks the postcards.



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Appendix 3

Excerpts of field notes from the fieldwork in the House for an Art Lover.

Excerpt 1
Tuesday, 4/Dec/01, app. 14:00

Group of two women, 50s (W1 and W2)

[…] Then they moved to the House, in the Oval Room. W1 keyed no. 21 on the audio guide for the commentary, W2 wandered around the room. W2 tried to twist the knob on the wardrobe door (it did not open), then she opened the cupboard. She went to the panel and she started reading it. W1 had a look around the room while she was listening to the commentary and then she moved in front of the panel and she started reading it while she was still listening to the audio guide (image). W2 left the room and W1 followed her very soon after.

They both went to the Music Room. W1 stood close to the index and she keyed the first number. She listened to the commentary for a few seconds and then she stopped it and keyed the next number. That happened three times on a row. W2 initially wandered around the room without listening to the audio guide. Then she went to the index and she keyed the commentary for the fireplace. She had some problems making it work. She managed to do so in her third attempt. I keyed the same number so I could observe whether her actions were influenced by the commentary. She stood 2 meters back from the fireplace (to have an overview?) and she moved her head across the wall according to what the commentary said. When the actual description of the fireplace ended she walked close to the window and started looking at the window banners while she was still listening to the fireplace commentary (image) (this commentary does not refer to the banners). Then she started moving around the room. When the commentary finished, she kept walking around the room but she did not key another number on the audio guide.

They then moved together into the Dinning Room (without stopping at the Main Hall). W1 stood close to the index and she keyed the commentaries one after the other. W2 keyed the introduction and walked around the room listening to it. When she finished, they both walked back to the Main Hall with direction towards the staircase. On their way there they discovered the Main Entrance and they walked in there. They exchanged a few comments and then they went upstairs. W1 keyed the commentary about the mezzanine balcony. W2 went directly to the drawings. W1 stopped the commentary and joined W2 in front of the drawings. They both looked towards the Main Hall windows and W1 said: –It is really beautiful to come at see it like this. W2 nodded in agreement. W1: –Although it was built in 1902, it looks quite modern. W2: –Yeah (nodding). They then looked at all drawings one by one. W2 started going down the stairs while W1 stayed behind looking at the drawings. She came downstairs a few minutes later. They both moved to the exit together. They left the audio guides in the designated box

and they left the House. They did not go to the café. Their visit lasted app. 30 min.

–✱–

Excerpt 2 (*Italics* indicate vignettes used in the main body of this thesis)
Monday, 4/March/02, app. 12:00 am

Group of two women, late 40s (W1 and W2)

A group of middle aged women (W1 and W2) arrived at the House for an Art Lover at around 12:00 noon. They bought their tickets and audio guides and went upstairs. They sat on the bench in the video room and they watched the whole video without talking to each other. At the point where the video shows the cabinet in the Oval Room, W1 commented on how detailed it was. When the movie finished, W1 took an extra copy of the 'dinner concerts' leaflet [from a leaflet holder next to the video room door] and then they went out of the room with direction towards the house. I stood up, I left the room and I walked towards the swing doors. Before they passed the swing doors W2 turned to me and asked me if they should go to the interpretation area first. I replied that I was not so sure and that it was up to them to start wherever, still facing towards the House. W1 suggested to W2 that "we should start from the house where the original entrance was". They finally turned and walked into the MacDonald interpretation area first. They both started looking at the gesso technique display (on the left side of the room). (Vignette 6.1)

While looking at the gesso display W1 asked W2 how the audio guide worked. W2 said: –Press the number and then "PLAY", she did teh same with her audio guide. W1 followed the instruction by pressing number 1 and PLAY and it worked. Then W1 asked: And now what? –W2: And then "STOP"; you press "PAUSE". They both started listening to the 1st commentary [note: the 1st commentary refers to the Entrance not the interpretations area!]. They listened for a few seconds while they were looking around. They were still standing in front of the gesso technique display. They stopped the audio guides and they moved in front of the display that explained the making of the banners. W2 pointed at photo on the graphic panel of the display and she said that that was from the Willow Tearooms. Then they both moved in the stained glass area. Then W1 started walking towards the exit. While W1 was still walking towards the door, W2 asked W1 if she had been in the Hillhouse in Helensburgh. W2 stopped in front of the interpretation area about the wooden paneling. W1 was already outside the room. W2 called her to come in again and to have a look at the staircase. W1 went back into the room and looked at the photo. W2 commented on the paneling. They then moved together outside the room. I followed them to the Oval Room.

They keyed number 21 on the audio guides and listened to the commentary walking around the room. W2 went to the information panel. W1 went to the information panel too. W2 pointed at the photo on the panel and said to W1 that that was the original room. They were still having the audio guides next to their ears and they were discussing loudly. When the commentary said about the cabinet, W2 pointed at the cabinet and said to W1 that those were the glasses that the video [re: introductory video about the making of the House] was talking about. They pointed out things to each other, e.g. W1 pointed out the decoration

of the fireplace. W2 was impressed by the cleanliness of the white carpet: –I wonder how they keep it clean. When the commentary finished W1 asked: And now what? W2 said: You press "STOP". W1 pressed "PAUSE". They moved to the Music Room.

They both looked amazed and they commented on how beautiful the room was. They stood in front of the index and W1 said that numbers 11 to 15 corresponded to that room. They both pressed 11 and they moved towards the fireplace. They were listening to the commentary and they pointed at things. W2 pointed at the cabinets. Then she pointed at the stencil on the wall and she said that "the house is good to get ideas" [for decoration?]. They both moved towards the piano. W2 commented on the woodwork on the piano. The commentary says about the "tree symbolism" of the interior of the room. They looked at the flower decoration on the top of the two posts of the piano. Then the commentary said that the interior is continued in the exterior environment too [meaning the trees in the garden]. W1 said "aha, true" looking outside the window. When the commentary finished, they left the room and they moved through the foyer to the Dinning Room.

They looked at the index and they both keyed the number of the introduction on the audio guide. They both walked along the left side of the table listening to the audio commentary, and pointing out and talking about the stencils and then the gesso panels. At that moment they both stopped the audio guides and W2 pointed at the gesso panels on the right side of the sideboard and said that those were the panels that were shown in the video [introductory video in the interpretation area]. –W2: ...and it tells a story [this is the exact phrase on the video]. W2 took a step back and she looked at the whole series of gesso panels on the left wall. –W2: ah, yes [as to agree with the video or like she had just discovered what the video meant]. W1 tried to remember the ingredients of gesso [as they were described in the video]. She recalled the rabbit glue, commenting that it was disgusting. W2 said (in a joking tone) that she could order some of them [meaning the gesso panels] for her dining room. They both circulated the table and moved towards the door of the dining room and they looked outside the last window on their left [the view from this window is of trees and the Science Centre tower] commenting that such a house would never have been built in Ibrox. (Vignette 5.1)

They moved through the foyer quickly towards the original entrance (the time at that point was app. 12:45 pm). They went out to the original entrance and then they came back in Main Hall. W1 asked W2 whether they could go upstairs. W2 replied that she thought that it was not permitted. They spent a few seconds reading the wedding panel and talking about that [this is a promotional graphic panel produced by the House of An Art Lover to advertise the venue for wedding receptions. It was situated at the bottom of the staircase]. I walked upstairs. They walked upstairs immediately after me. They talked about the chandelier in the landing and the width of the staircase. When they got to the mezzanine, they had a quick look at the sketches. W1 asked W2 whether they had enough time and she added that she was feeling a bit hungry. W2 reassured her that they had plenty of time. They both went downstairs, first in the toilets and then in the restaurant [where they had made a table reservation]. Their visit to the House lasted app. 1 hr.

Appendix 4

Excerpts of the debriefing interview transcript of Trial 7 [29/May/2002]
Participants: R1 = Researcher 1, R2 = Researcher 2, LP = Local Participant (female), VRP = VR Participant (female).
The two participants were writers, very good friends and avid museum goers.
Excerpt of the trial were used in Vignettes 6.3 and 6.8.

[...]

R1: So how did you get on?
VRP: I think generally it was good. You know, generally, I knew were you were (to LP). I felt I could move around as well as you, better even than you.
LP: You went through my head!
VRP: I felt quite comfortable with the situation.
LP: [Pause] It is quite strange how surprisingly easily you adapted to see someone as a triangle moving around.
VRP: You see you had a face, two eyes and blond pigtails.
LP: Oh, that's nice!
VRP: It was quite sweet. I though it was my new friend.
LP: And then the voice worked so well, cause you know, you well respond to the human voice... I felt like you were there and I adjusted very quickly to that...
VRP: Was enjoyable, an enjoyable thing to do.
R1: What did you think about the map?
LP: Worth for checking where you were, rather than...I didn't navigate by that obviously because I could see what was around me. I found it hard to describe to you where I was going. I could only do that by kind of objects really, using the cases as landmarks...But I used to know whether (VRP) could see where I was, that's about it really.
VRP: Yeah, I found it...that's probably the only thing that I found it easier to look about to see you because it's a small room.
R1: Where a few times that you two lost each other?
VRP: Yeah, the timeline was good because it was something that was quite definitely on your left or right; that's a good thing.
LP: I could see if you (to VRP) were in front of me or behind me but I wasn't sure whether your left or right was the same as mine. Is that making sense? ...I had to use a compass almost to say you are west or east or whatever of me.
R1: Is almost like wanting to point, isn't it?
LP: Yeah...
VRP: I don't know, I think the only real kind of difficulties were more because of the expression than the system, if you see what I mean...You know things, like not necessarily being able to see the same things when we were looking for them to answer the questions or we were trying to look at things together. I don't think we were seeing the same, or trying to get the same information... that's maybe changed the expression...
LP: Also the exhibition itself is pretty, was very virtual. We were looking at the similar things. I would find it in a way more useful if we were looking at actual paintings and you had the image on screen because...
VRP: ...that would be really good.
LP: I was looking at the image of a painting than the painting itself.

VRP: It would work really well for normal exhibitions or museum things, something in a case…
LP: Yeah, because we were seeing more or less the same thing where in an image you could say something about the texture of a painting. I couldn't be able to describe the texture of the painting because I was looking at a flat screen as well. I can see that it'd have other uses perhaps that we didn't have here.
R1: I suppose it is quite different of what you normally do when you go to a museum together? How is different?
VRP: We wouldn't normally talk…
LP: Normally we wouldn't talk to each other in an exhibition, not to the same degree.
VRP: That was fun. [Pause] Talk about it afterwards rather than at the time.
R1: Why do you think that is?
LP: I think it destructs people. I think it destruct other users. And I also think, and then when you go and see a movie, you do not talk during the movie cause you feel it's a bit rude sometimes.
VRP: I think it was fun though. I quite enjoyed the social engagement of seeing an exhibition in that way, being able to talk about everything more and not feeling that you had to…maybe think about being other users of the gallery. You know it's kind of liberating.
LP: Yeah…I think also that when you go to see an exhibition you want to look at it yourself and get your own thoughts together and see what kind of impact it makes on you and then afterwards you discuss it with your friend. You know depending on…depends on what kind of exhibition that was really. Some times you see things that people…you haven't seen before except in a book and you don't want to be, you want to just be looking at it and seeing what you think about it.
R2: have you visited exhibitions together?
LP+VRP: Often, yeah
R1: Do you think having this audio connection made you talk more?
VRP+LP: Yeah, I think it did, yeah
LP: Yeah, I would like I was thinking…if you were in different places, if someone was looking at a painting and you were online you might be able to access all sorts of information that I couldn't
VRP: Yeah, that would be really good. That's what I expected. I expected that I would have more text so I could look up and tell you more things than you would be able to get. But because I think that was a virtual exhibition maybe you would be able to tell but if it was a straight exhibition it would be good to be able to look up lots of different things and other…
LP: It feels more like a detective in a way
VRP: Yeah, that could be quite enjoyable.
LP: About redressing the balance of power as well.
VRP: Yeah, you can get a nice balance: you can tell me about the actual thing and I can tell you all about it.

[…]

R1: Well, you had this audio link; would you like to be able to mute it?
LP: No
VRP: No, I don't know… That was maybe because of the context.

R2: Did you use each other to answer the questions?
LP: I think we used each other. We cooperated.
VRP: Yeah, it was quite nice. I think we did, because we though, each of us really thought that the other had different information and just remember where something was…
R1: Do you think that you got more of the virtual reality that you would get of a normal webpage?
VRP: Yeah, I do look, I do look at museum and gallery web pages quite often and I really like it when they have some kind of 3D images, and you can walk into the room and see what is there, I think it's quite exciting. It does give you more about an impression of what is like and what the building is like. Though you need all the stuff backing up and being able to get better image quality and text and stuff… I think it's really good, yeah.
R2: Did the fact that you had audio from the real room make any difference?
VRP: I think it did. It made it more fun. So maybe if you're accessing on your own it would be nice, you know so many galleries of these kind of tours that you put on, you know that you can get the tape recorder thing…taken through the space would be a nice option to have. Educational...
R1: That was one of our initial ideas…
VRP: That would be great to go on the tour without people getting on your way. And you could ask questions. That would be really good.

[…]

R1: So you were in the room chatting, did you feel self-conscious doing that in a room sort of thing, something you would do on your phone or something?
LP: I think that I would be quite concerned about other people that were looking and you wouldn't want to stop their enjoyment of it. I think that I would be concerned about that really. And that space was very comforting. If I knew that it was an important exhibition and people maybe had travelled to come and see it I probably wouldn't feel that comfortable talking that way because I might be spoiling other people's enjoyment really. Again that would depend on the exhibition; there are some exhibitions that are quite noisy events and that would be fine with me. Yeah, I think that would worry me.
R1: How did you feel that was different from just going on your own to that room that to have someone you could talk to?
LP: I did quite enjoy it; I did enjoy it. Normally, we wouldn't talk so much. I think it's nice to go to an exhibition with somebody in the way you go to the theatre, or a movie and then have someone to talk about it, bounce ideas of them. So we would do probably the same thing afterwards. Although we may point things to each other while we were there, you know "have you seen this?" "have you noticed this?".
R1: In some ways is a bit like combining going for a coffee afterwards with being there because you are doing so much talking.
VRP: Yeah…
R2: Did you mind the headphones?
LP: I was quite comfortable with them.
R2: Did you mind that you couldn't hear anything else that was happening around?

LP: No. It was a quite quiet space anyway. I did not feel disorientated or anything like that.
R2: Was the device hard to hold?
LP: I think it might've got awkward after a while; after a while it might've got awkward. For me it was ok. I think perhaps if you were elderly or something it would have been a bit too much. I didn't find it too much of a problem. I sort of forgot I was doing it.
R1: Did you use it for the map?
LP: I just looked at the map to see were VRP was, I didn't use it to navigate or anything and that was ok; it was all right actually.
VRP: I suppose if it was a big gallery you would use it more to navigate…
LP: If it was the Tate or something, maybe… It was a very small room as you say. It wasn't too much of a problem really.
R2: Do you think you saw more things that you had seen yourself or fewer things?
LP: I think probably the same as I would normally see. What do you feel? (to VRP)
VRP: I don't know… It's hard because I couldn't… I guess the same. You can probably use it either way, just depending on if you want to follow certain information, follow links or you really do that or else you could look at…
LP: I think if it was virtual… I suddenly thought I would like to see more book designers and Mackintosh did some books and things we didn't find any.
VRP: Neither of us could find anything on that.
LP: I reckon if they weren't any, there would be a key or something that you might've been able to…
VRP: That would've been handy to have on the handheld thing, to type down what your interest is…
LP: Yeah, like an index or context or something like that…
VRP: or scroll down and see.

[…]

R1: Was there anything you saw about Mack you really liked?
LP: I guess I was vaguely familiar with a lot of them; there was a huge exhibition quite a few years ago in Glasgow, so reminding perhaps rather than introducing. And I did think, "Gosh, it's a long time since I've been to the Hill House, I should maybe go and have another look"…
VRP: Yeah. I felt that too…I thought of going to places that I haven't been.
LP: because I haven't been there for a long time.
VRP: Scotland Street School…
LP: Aha, I guess it was more of a spark to do something else rather the exhibition in itself cause I am not a great fan of exhibitions where you just have screens and things. I'd rather see the stuff. Probably it has its uses but I don't think it's as interesting to me.
VRP: I think that's true. I quite enjoyed looking at the timeline, it looked good but the actual thing looked good too; it was very good to put them in more of a context of other things that were happening. Whereas I would've probably looked it more in isolation as Mackintosh. You know you go to the Art School, you see Mackintosh. It was good to try to fit it in other ideas that had been around at that time. It's something I hadn't done before. But yeah, like LP I would go and look

at the Hill House again. I will try to make the effort to go and look at other buildings cause I've seen pictures now. It would be interesting.
R2: Do you feel that visiting the room in a virtual way was enough or you would like to see the "real" room?
VRP: The real room did look quite exciting. I went in and, cause it's all really shiny and screens and wires but I don't know if there is anything behind that…I suppose the graphics are always gonna be a problem cause you can't have the detail of, you know, the detail of the real thing. I don't know if you can incorporate text on the graphics so when you are walking around and you can see the box that's "Furniture & Design" if that actually appeared in the graphics window so you could kind of go there and you see the screen…maybe that would make your movement more natural than I was looking, but it came up very fast! As you moved about that seemed to be fine, as soon as you hit something hot it came up in the screen.

[…]

R1+R2: Thank you!

—✳—

<u>Excerpts of the debriefing interview transcript of Trial 8</u> [31/May/02]
Participants: R1 = Researcher 1, R2 = Researcher 2, LP = Local Participant (male), VRP = VR Participant (female), HP = Hypermedia Participant (female). The three participants were colleagues and friends. They all enjoy visiting museums with friends.
Excerpt of the trial were used in Vignettes 5.6, 6.4, and 6.10.

[…]

R1: Did you enjoy yourselves? Is what you expected?
HP: I found it quite weird having people who were three-dimensional and 2D information of the room. It took me almost 10 min to get used to it.
VRP: I think because I do play computer games quite a lot I found that quite natural, I didn't find that at all unusual. To be able to walk through walls is a bit of a strange.
HP: You had physically (to VRP), when you looked on the walls…
VRP: No, all the information was on a web
R1: Did you find that you moved about ok? How did you find about finding things in the room and where the other people were as well?
VRP: Finding people for me wasn't that hard because of the big floating heads. Finding information was a bit more difficult and I ended up using the menu on the side more than actually wandering around the room. I guess as soon as I knew the layout was a bit different because everything looked the same till I went close to it. It was easier just to use the information on the other side.
HP: Yeah, I found the same. I think that at first when I tried to find the information by just using the map I hadn't the sense of what is in the room, so I started using the links and that was easy. I was much happier just to use the text based and the links, click myself through kind the thematic themes than lean on the map because I found that quite confusing.
R1: What about using the map to find your friends?

HP: That was ok the beginning, we were looking at the same thing. Yeah, I thought that was quite good.
R1: But only at the beginning?
VRP: I thought that LP run quite a lot. But that was the pigtails…
LP: That was the map, it wasn't…
VRP: That was the map in a way.
R1: So what about you LP, did you use the map to find where the other people were?
LP: At the beginning, almost felt like the visit was almost too basic; at the beginning which was this sort of interesting just recording three people looking at the same thing. Then I kind of ignored it, the questions were a bit more purposeful, at that point I wasn't so bothered with the coordination thing. And I just told you where I was, through the audio channel. It was a bit, because my icon was jumping all the time, I thought that I would be hard to follow, kept saying I am here, trying to get to see the same thing.
R1: Did you find that it was quite inaccurate?
LP: Yeah, my icon. I noticed that at the beginning, it might calmed down later but I sort of did that at the beginning when I was standing still then I thought that it was probably easy with the audio channel to say where I was and…

[…]
R1: VRP, did you feel that you've got more than just using a web page?
VRP: Yes, I could see the relationships between different parts of the room. I think, in particularly given the fact that I was interacting with the other two because it's quite, it's not unexpected of you, it's almost a quite natural way of interacting with information. And I think it hadn't been the case as I got close to different displays, I could see where the different displays were…I could almost see what I would find before I got up to it. I think it was an interface that is a quite natural of organising information.

[…]

R1: You had a shared audio channel, how do you think that was doing? How did you use that?
LP: That was the key part for me doing it… It was nice actually having the voices and chat and companions.
VRP: Again it helped me reinforce the idea of this visualisation I've been looking at being quite realistic. It gave a kind of natural reflection of what I was looking at, given that I was interacting, I could imagine LP standing there, with his pigtails, he was talking about the place he was at because I was looking at the map it was kind of easier to know where they were. Whether that would be the case in a bigger scale…
R1: Having this audio makes it a bit different than a museum visit together.
VRP: You are not normally… to speak in museum rooms, not laughing loudly.
LP: Yeah, not… noisy, mobile phone use in the wrong place.
HP: That's right, because we wouldn't have spoke that much if the three of us would have been in that room. But I found that mostly a lot of what I was really saying or asking was about what other people see or where is that or how is that presented. So I think you sort of interact with the stuff you are looking at in a different way because it's almost translated for different purposes, express it to

tell other people about, and compare it to what other people see. It gives a different kind of perspective.
LP: It would be harder to go around with the audio channel without the questions. That would be harder to visit…
VRP: I wonder if you were looking at something new. Mackintosh, we are all kind of familiar. Perhaps, if we are going to see something that we haven't seen before and you were there in the ground and I was looking at images of it. It would actually be nice to share opinions as you were looking rather than sat down and have a coffee afterwards to talk about what you've seen. A bit more engaged…

[…]

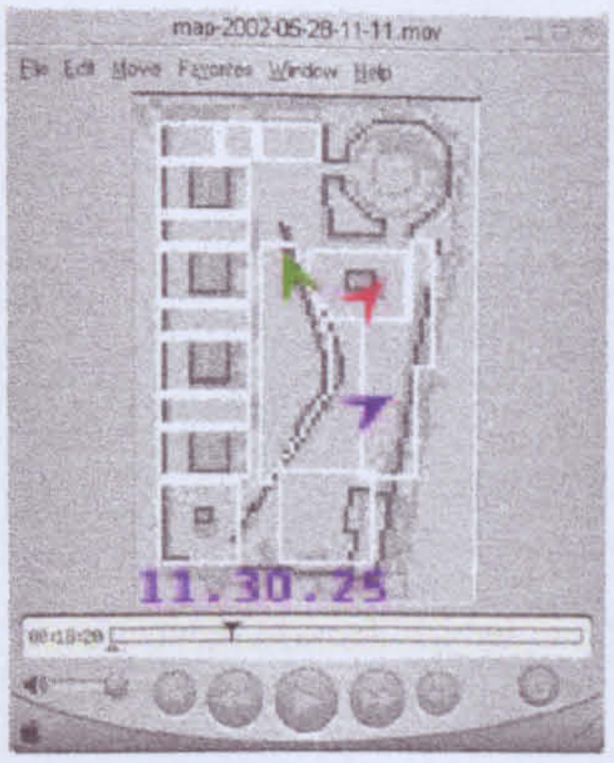
R1: Do you feel like you have done something very different?
VRP: Oh, yeah, I think that I was in that respect, because I was looked for information. I don't know, I think I'm more enthusiastic than you are (to LP).
LP: Oh, no I liked it, just it feels very different. No I liked it. I guess my scepticism was, where, is that what you do when visiting museums? Answering questions?
VRP: I just think that visiting museums is a bit passive; you sort of just stand there being impressed. The idea of being a bit more interactive and finding other people's reaction, I think could be, in fact a kind of more communal response.

[…]

R1+R2: Thank you!

Appendix 5

Snapshot from merged video recordings from the trial sessions in the Mack Room (image c). The final movies were the result of merging in one viewer, a movie generated of the video recording of the local participant (image a), a movie of the map display generated of the positioning system log (image b) and the audio file of the conversation among all participants, recorded in a mini disc. The final merged movie was a .mov file.



△ Image b

◁ Image a

▽ Image c

G (local participant): This is the Glasgow Herald Building