



Technical Report N° 2008/20

A Study of the Use and Appropriation of Multipurpose Technology-rich Spaces

Nadia Pantidi

*23rd December 2008
Student Research Proposal*

***Department of Computing
Faculty of Mathematics and Computing
The Open University
Walton Hall,
Milton Keynes
MK7 6AA
United Kingdom***

<http://computing.open.ac.uk>

A Study of the Use and Appropriation of Multipurpose Technology-rich Spaces

First Year Probation Report

Nadia Pantidi

DEPARTMENT OF COMPUTING

The Open University, UK

Submitted – October 2008

Section 1 Introduction

This report documents my research topic, *A Study of the Use and Appropriation of Multipurpose Technology-rich Spaces*. The report covers how this was derived within the context of existing literature, and how, in a work plan, it will form the basis for my thesis submission.

This report is divided into five main sections covering:

- my proposed research question;
- a review of the existing research and theory that sets my research in context;
- a description and justification of the research methodology to be used;
- a report on my empirical work; and
- a work plan to realise the research.

This report is one of the four constituents of the first year probation assessment.

Section 2 Research Question

This section describes the development of my research question. My research will investigate how technology-rich multipurpose spaces are being used. When we refer to multipurpose spaces, we mean that the same space can be configured for a variety of work, social and learning activities and for different user groups; the space is adaptable and flexible to people's changing needs and activities. *Technology-rich multipurpose spaces* are multipurpose spaces embedded with technological devices and applications that create new affordances for the space itself and promote the reconfigurability already in place. Nowadays, wireless technology has transformed many spaces to be multipurpose; for example, a refectory with wireless access can be a dining place but also a place where people can have informal meetings, check their emails or watch online programs. The difference between the previous example and the technology-rich multipurpose spaces that I am referring to, is that the latter are designed specifically with the aim of being multipurpose; namely both the technology and space have been configured in such a way that they support a variety of activities and different groups of people at the same time. Such spaces at the moment exist mainly in academic premises (e.g., InQbate, 2008; Saltire Centre, 2008). Technology is treated as a means to enable the users' activities. The technological devices embedded in the space can be either customized applications and tools, designed specifically for the space, such as large public displays (Churchill et al., 2003; Izadi et al., 2003), or broadly commercially used tools such as projectors, plasma screens, LCD screens, whiteboards, etc (e.g., Glasgow Caledonian Learning Café, 2008; InQbate, 2008; Saltire Centre, 2008).

During the last few years, there have been several studies of technology situated in specific places such as public spaces, workplaces, households or educational settings (Berker et al., 2005; Grasso et al., 2003; Khine and Fisher, 2003; Mackay and Ivey, 2004; McDonald et al., 2008; Milne and Winograd, 2003; Streit et al., 1999, 2003; Trimble et al., 2003). This line of research focuses on understanding how technology affects the space and people's everyday life and vice versa; and whether the technology serves the purposes it was designed for. My research aims to build on this body of work by investigating how people interact with technology in spaces that have been specifically designed to support multiple uses by groups of people at the same time. These spaces are quite recent and

rapidly increasing; requiring an understanding of how they are actually being used. The questions I will address in my research are:

- What is involved in multipurpose technology-rich spaces?
 - How do people behave and interact with the space?
 - How do people interact with each other and the technology?

Using participant observation, semi-structured interviews, documents and data from naturally occurring conversations, my aim is to identify the interdependent aspects that shape the everyday use of multipurpose technology-rich spaces. A review of the literature showed that these can be classified as social, physical and technological and are tightly related. As Mitchell (2003) comments *“you can’t really separate the issues of technology and the space that accommodates it (...) you have to think of the two of them together”*. This suggests that *you can’t really separate the issues of **technology** and **the space** and **social context** that accommodate it. You have to think of the three of them together*. More specifically, my research will address the gap between anticipated and actual use of technology-rich multipurpose spaces, following the findings of a pilot study; and will extend this in terms of the process of planning activities for such spaces. In the pilot study, which was carried out in a technology-rich multipurpose space in the OU campus, it has been found that the space was used mainly as a private meeting room instead of public play space as intended. Also, the use of technology was limited despite its abundance and the many motivating cues and clues for that purpose. This work (for detailed findings see Appendix) has been published and presented in the HCI2008 Conference (Pantidi et al., 2008). Following this work, for my main study, I will examine the tensions that may arise between anticipated and actual use, planned tasks and the actual outcome and between different expectations of the parties involved (organisers, facilitators and participants). Other themes that are considered for investigation are the handling of unexpected situations (fire-fighting) and the motifs of emerging behaviours and interactions. In particular, I will examine:

- what is arranged in order to have a successful outcome,
- how is this arrangement achieved,
- which actors are involved,
- what specific activities are planned and how are they realised,
- how are crises managed and
- what is meant by a successful outcome.

For my main study, I will initially look into the planning and the running of a two-day workshop that took place in InQbate, a technology-rich multipurpose space at the University of Sussex. InQbate is a CETL space (Centre for Excellence in Teaching and Learning) that aims to enable groups of individuals to come together within a high technology environment to communicate their ideas and generate their designs in a creative way. InQbate is technology-rich but not technology-driven which means that the technology is primarily used to augment the space or the activities accordingly to what is needed each time. It is a blank space that can be shaped into almost anything depending on the activity that takes place. My main study aims to build upon the findings of the pilot study and look at how InQbate is used and appropriated for different activities. In this respect, I will investigate the use of the space together with the planning of open-ended, multipurpose technology-rich spaces. My research will explore whether the spatial adaptability and the technological possibilities offered by InQbate influence the way people use the space, plan and negotiate activities. Following the initial study of the two-day workshop in InQbate, more observations are expected to take place in the same setting as a way of acquiring a better understanding of the use of the space for different activities. The analysis and interpretation of the findings from this study will be used to define the nature and the content of studies to follow. In respect of the research outcomes, my aim is to provide a better understanding of how multipurpose technology-rich spaces are appropriated. The ethnographic findings are situated and tied to the context of the specific setting; however, by achieving a rich description of the setting insight will be gained as to what are the limitations to what has been observed. This level of understanding, in particular key themes, is what will be used to generalise to other similar settings. It is hoped that this knowledge will assist in the future design of similar spaces. As new technologies keep moving into spaces and becoming more embedded, there is an increasing need for evaluation from a holistic point of view.

Section 3 Literature Review

Much research has been carried out over the last few years to understand how people behave and interact with technology situated in specific places. There is a range of technologies that has been studied including situated displays, multi-touch screens, interactive displays and proactive displays; and a variety of spaces where the technology has been implemented such as public spaces, classrooms, workplaces, lounges and conferences. The goals of each study have been varied including to enhance the feeling of community, facilitate social networking, support informal meetings, and to promote collaborative work or play. Nevertheless, what is common in all these studies and related to my study, is the objective to understand the interaction between technology and people in real world settings; to observe what really happens when the technology is in place and how people use it.

Among the literature twelve studies have been chosen as closely related to my research. A brief presentation of these studies follows. Brignull and Rogers' (2003) early work focuses on how groups of people socialise around public displays; in order to explore that, they have designed and placed in two different social settings the Opinionizer, a large public interactive display. Churchill et al. (2003) describe the design process and present results from qualitative and quantitative evaluations over the course of a ten-month deployment of three interactive digital poster boards, called the Plasma Posters. Trimble et al. (2003) describe the design and provide a preliminary evaluation of NASA's MERBoard system, a large interactive work surface that involves several distributed, large touch-enabled, plasma displays with customised software. Grasso et al. (2003) discuss how ambient displays can support informal communication in organisational settings and report on the evaluation of CWall, an interactive large screen display prototype designed to support informal communication at the Xerox Research Centre Europe. Similarly, Russell and Sue (2003) discuss their initial field study about the use of a large interactive display surface, the BlueBoard, designed to support collaboration,. In their later work, Brignull et al. (2004) implemented Dynamo, a large multi-user interactive surface, that was designed to enable the sharing and exchange of a wide variety of digital media, in the common room of a high school and report on their findings on how the students used the new technology within their own established communal space.

Mackay and Ivey's (2004) ethnographic work explores how media are used in the everyday life of households and also, the sorts of experiences, interactions and identities that are sustained or developed through media use. Huang et al. (2007) investigated the integration and uptake of the NASA MERBoards - shared interactive displays that were deployed to support science tasks - and discuss the hurdles to adoption that were specifically imposed by the real-world circumstances of the deployment. Recently, Peltonen et al. (2008) present data from detailed observations of the CityWall, a large multi-touch display installed in a central location of Helsinki, with the purpose of understanding how it affects and supports social interactions in public spaces. In O'Hara et al.'s (2008) work, a particular game was developed as part of the BBC Big Screens Public Space Broadcasting project, namely the Red Nose Game and was used as a means to explore some of the social and behavioural aspects of urban screen gaming. Huang et al. (2008) report on a field study that examines the current use practices of large ambient information displays situated in public spaces. And finally, McDonald et al. (2008) in their study report on the use of three proactive displays that were situated in an academic conference to augment the participants' interactions; specifically enhance the feeling of community, facilitate social networking and future collaborations.

Some important themes have emerged from these studies that inform my study. One overarching theme among these studies is the gap between intended use and actual use of both the space and the technology. For example, Huang et al.'s work (2007) discusses the *hurdles and challenges* that MERBoards' adoption and integration faced as a result of their real-world deployment. Similarly, McDonald et al. (2008) comment on how they were not so successful and began to re-examine one of their design goals in light of the real-world experience of their deployment. Moreover, in Dynamo (Brignull et al., 2004), users appropriated the functionality of the display in a way that was consistent with the space's previous use but did not extend its functionality to other uses as the researchers expected. Likewise, this gap between intended and actual use emerged as a prevailing theme in the pilot study of my research; D-space was used mainly as a private meeting room instead of public play space as intended (see Appendix). Other themes that emerged from these studies include the way people interact with technology in everyday life and show the significance of a rich understanding for improving the work in the field of human-computer interaction.

They belong in three general areas closely interrelated with each other: the social, the technological and the physical.

The notion of the social has been interpreted in various ways. First, in many of the studies, the technology situated in the setting aims to promote or explore social aspects of human life. McDonald et al. (2008) in their study reported on the use of three proactive displays that were situated in an academic conference to augment the feeling of community and facilitate social networking. Brignull and Rogers (2003) deployed an interactive public display to explore how people react, interact and socialise around public displays. Particularly, they were interested in the notion of social embarrassment that has been found to make people hesitant in using the technology. Peltonen et al. (2008) installed a large multi-touch display in a central location of Helsinki to understand how it affects and supports social interactions in public spaces. Brignull et al (2004) were interested to see how a community of people used Dynamo, a multi-user interactive surface, to publicly exchange, show and share an assortment of digital media (e.g., photos, video clips, web pages) in social, fun and collaborative ways. Also, technology has been found to create social identities and aid in shaping a common culture by linking the domestic private world with the public outside world in Mackay and Ivey's (2004) ethnographic work that explores the use of media in households.

Moreover, the social sets a context; the social conventions that exist in particular spaces and for particular behaviours; the social roles people take on and the feeling of community are significant parts in the interrelation between technology, space and people. In *Opinionizer* (Brignull and Rogers, 2003), people's conceptions about the display and its social etiquette and practices were the defining factors for the use of the technology. In *City Wall* (Peltonen et al., 2008), the observations showed that people engaged in roles such as teacher, apprentice or comedian. Similarly, the observations, before and after, of the space where Dynamo was deployed (Brignull et al., 2004), showed that previous communal use and social conventions of the use of the space were transferred in the use of Dynamo. Users appropriated the functionality of the display in a way that was consistent with the space's previous use and did not extend its functionality to other uses as the researchers expected. Similarly, in O'Hara et al. (2008) study, people appropriated the technology (a collaborative

game) to the social identity of the space and the activity itself. The game played in an open public space - a shopping and leisure area - and supported by large displays came to be used as a social resource for waiting activities, for accompanying eating, drinking, shopping and even for keeping children occupied while parents socialised. All these activities existed to the space prior to the technology being introduced and the game and its 'technology' were appropriated in the existing context. Again, this is not always the case, in another study, people appropriated the technology by extending its use in an innovative and fun way which conflicted with the common practices and social conventions already in place and thus, led to negative comments about the application (McDonald et al., 2008). Many other examples of people appropriating the technology and their implications about the interaction can be found in the literature. What is important is that people do appropriate the technology and the space. The way they do that, depends on the specifics of the social and physical context of each setting.

Another aspect of the social is the effect of the audience on participation and interaction. In O'Hara et al. (2008) and Brignull and Rogers (2003) studies, the presence of audience combined with the public nature of the setting and the display, generated feelings of embarrassment and unease among the participants. People felt like they were being watched and this made them feel vulnerable and more self-conscious of possible mistakes. These feelings were more common particularly when the audience included strangers. Such feelings can deter the use of technology in public settings. On the other hand, once social inhibition was overcome, the audience was found to have social facilitation effects. In O'Hara et al. (2008) study, players started performing for their audience and being motivated by it. Specific behaviours were observed being conducted just to 'show off' to or amuse the audience. Also, in Peltonen et al. (2008), participants used the content and the features of the interface as resources to coordinate their actions in a way that was meaningful for those watching. Verbal comments of the audience reinforced such behaviours. What these findings show is that the audience creates a social context within which the interaction occurs. The significance of verbal reinforcement and demonstration for initiating engagement and establishing participation is also apparent in the studies by the presence of facilitators. The *comperes* or the *helpers* contribute in the use of the display by helping understand its use,

overcome initial social embarrassment or difficulties in the manipulation of the interface, keep the participants and the audience excited and engaged (Brignull and Rogers, 2003; Churchill et al., 2003; O' Hara et al. 2008).

Another factor that affects interaction is the technology itself. The affordances of the interface can shape the selection of interactions available to the users. One example is the type of input devices and manipulations available. In Dynamo (Brignull et al. 2004), the wireless keyboards and mice allowed users to interact with the application at the same time and without any explicit negotiation. In City Wall (Peltonen et al. 2008), the fact that the interface required both hands for object manipulations, generated behaviours of explicit collaboration between people holding drinks and shopping bags and thus having only one free hand. In the same study, the user interface caused people often to unintentionally break territorial borders and ruin other users' work, which led them to withdraw, retaliate or seek comfort from the audience. At the same time, these "conflicts" were also used positively as the main excuse for conversation and interaction between strangers. Likewise, in Russell and Sue's work (2003) the feature of BlueBoard handling only one touch point at a moment led the users to regulate their interaction and collaboration through turn-taking.

Another example of how the features of the technology influence the interaction lies in how inviting it is. Brignull and Rogers (2003) report on how an easy-to-use, appealing to the eye application increases the chances of people crossing the threshold of *focal awareness* and hereupon the threshold of *participation*. Churchill et al. (2003) and Grasso et al. (2003) showed how embedded attractiveness and low effort design received positive feedback from user reports and use monitoring. Davis et al. (1989) posited in their work that perceived ease-of-use -along with perceived usefulness - define people's acceptance of new technology.

Another important issue is that of access and control. The way access and control are negotiated depends on the particulars of each application and the purposes it serves. Sometimes, ease of access and direct control over the application can be inviting and enhance the engagement and participation of the users (Brignull and Rogers, 2003). In other occasions they can raise problems of privacy or trustworthy content (Grasso et al., 2003). Limited access has also

been reported to make the learning, training and use of the technology difficult and lead to the application being a supplementary tool rather than the primary one as intended (Huang et al. 2007). Similarly, in the work of Churchill et al. (2003) denying access to the users that wished to appropriate the Plasma Poster Network - a system of interactive digital poster boards - led to frustration.

Intrinsically related to the social and technological context is the physical. As discussed before, physical spaces are often tied to specific social behaviours or practices that are fixed. Spaces bear social labels - either explicitly or implicitly - that are formulated by their occupiers or imposed on them by common practice. In addition to the socio-physical factors, purely physical characteristics of the space can affect the use of the technology. One example is the positioning of technology in the space. In O'Hara et al.'s study (2003) the notion of *catchment areas* was discussed; that is, how the positioning of the displays defines the potential audience who may come to see or interact with them. In Opinionizer, Brignull and Rogers (2003) suggested positioning the display along the thoroughfares of traffic (e.g. near a bar) to improve the ways in which the interaction principles of the display are communicated implicitly to bystanders. In O'Hara et al. (2008) study, observations from three settings in different cities showed variant interactions that were attributed to the different physical affordances of each setting. In the same spirit, Peltonen et al. (2008), based on their observations from City Wall, comment on the fact that having a large screen and an enticing content in a central public space does not automatically ensure visibility. Urban environments are full of visual cues and people are selective at what they attend to; often focusing on human behaviours rather than objects. Resulting from that was the pattern observed of people noticing the display mainly when others were using it. The same observation of large screens not being as eye-catching as assumed in public spaces was also supported by Huang's et al. (2008) ethnographic work who suggest that small displays were found to be more inviting and open to prolonged use. In this case, small displays created a more private and intimate setting compared to large ones, as they eliminated the social exposure and unease that pairs with the audience effect.

Another effect of physical space was observed in the work of Huang et al. (2007) where the shared location of the MERBoard, a shared interactive system, made the users less willing to explore, experiment and feel free to interact with the

displays. Likewise, Grasso et al. (2003) in their evaluation of the CWall discuss problems related to changing the location of the display. In this case the change of location not only affected its use but also the quality of its content. When CWall was moved from the entrance foyer to the cafeteria, its use decreased, due to people's bandwidth of peripheral awareness being completely different between the two locations, which in turn led to people not paying attention to the screen. Also, the availability and sense of ownership changed from including a small community of users to including everyone, which led to more playful experimentative behaviours and less devotion in submitting useful and trustworthy content. Moreover, in the Red Nose Game (O'Hara et al. 2008), the small space - due to a barrier placed in one of the settings - created a physical proximity that promoted a highly coordinated collaboration strategy, observed mostly in this setting.

Finally, related to the physicality of the space and how it affects the way people interact with technology, are the restrictions that space imposes. These restrictions can be issues of health and safety that must be taken into consideration when deploying technology in real environments, especially when the use is long-term or unsupervised; or they can be constraints of the existing infrastructure of the space that were not foreseen as significant before the installation (Huang et al. 2007; O'Hara et al. 2008).

To conclude, previous research on displays situated in public settings shows the complex social, technological and physical factors that affect the way people interact with technology. These findings have been influenced or interpreted by theories of sociology, architecture and philosophy (Foucault, 1967/1986; Goffman, 1961, 1963; Tschumi, 1996). In particular, Goffman's book *Behavior on Public Spaces* (1963) has been most influential on the interpretation, for example, of the results in the McDonald et al.'s observational work (2008). The way participants used each of the three proactive displays and also, the interactions that took place during the conference are described through the theoretical framework of Goffman's notions of *unfocused* and *focused interaction*, *shielding* and *multifocused* and *fullyfocused gathering*. Goffman's theory is considered very important for the interpretation of my own results as well; it offers an insight on how people behave in public spaces depending on the social occasion at hand. Equally significant for my research are theories from

social psychology (Forsyth, 2006; Levine and Moreland, 2006), media and communication (Meyrowitz, 1985; Sigman, 1995) and architecture (Hertzberger, 2000; Tschumi, 1996). For example, Hertzberger adheres to a structuralistic philosophy of 'spatial possibility' in which architecture is used to provide a spatial framework through which **users influence a building's design**. He emphasises in designing flexible and adaptable buildings -*polyvalent* is his definition- that promote informal contact, group work and the socialisation of many cultures; and has applied this socially inspired theory to a range of buildings including housing, schools and offices. In his vision, architecture is about people; the form and plan should be derived from human experience and need: both physiological and psychological. These elements of Hertzberger's work -focus on human experience and need, interplay between users and buildings and polyvalence- provide a valuable background for my research and the interpretation of my findings. Similarly important for my work are: Tschumi's interest in extending self-awareness through architectural design, Meyrowitz's description on how modern media have shaped and influenced people's everyday social relations, Forsyth's work on group dynamics, Levine and Moreland's collection of small groups characteristics and Sigman's discussion on the consequentiality of communication.

My research aims to build on this previous work by investigating the gap between intended and actual use and how people interact with technology (e.g. large displays, tabletops) placed in spaces that have been designed to have multiple uses by groups of people. In the previous studies, the technology was designed to serve specific purposes. Also, these multi-purpose spaces are quite recent and a better understanding of how they are actually being used is needed. In my pilot study, a number of factors proved to be significant for the understanding of the space. Furthermore, various patterns emerged from the observations and the interviews, such as the way people appropriate the technology and the space for their own rather than intended use, the social practices and conventions that interfere and assign a specific identity to the space, the existence of many cues and clues that results in confusion and abstinence from use. My goal is to contribute in extending this understanding by providing further insight into the differences between planned and anticipated use and actual use.

Section 4 Methodology

Overview

The principal research methodology is an ethnographic study of technology-rich multipurpose spaces. The ethnographic approach was chosen for it best suits the specifics of the research question as it enables an *in situ* exploration of how these spaces are actually used. The approach will involve participant observation and semi-structured interviews. Material will be recorded using fieldnotes (made during or after the observational sessions), audio and video recordings (where necessary), still pictures and documents. The main study will entail collecting data from the InQbate, a multipurpose technology-rich space at the University of Sussex for about half a year. This will enable an in-depth study to be carried out, examining a variety of activities planned and carried out in the space. The analysis and interpretation of data will follow data collection and will be orchestrated in terms of the prevailing themes and existing tensions between actual and anticipated use.

The methodological approach

The definition of ethnography is contested by ethnographers themselves. Some equate ethnography with any method that involves an element of *in situ* participant observation (e.g. Taylor, 1994). For others, the essence of ethnography is not so much its basis in participant observation but its epistemological stance, which is firmly located within a socio-cultural frame of reference (e.g. Hutchins, 1995). Also, there are different types of ethnography used in HCI. On the one hand, there is traditional ethnography that requires a long period of fieldwork, where the ethnographer is fully immersed in the working environment observed; on the other hand, there is 'quick and dirty' ethnography (Hughes et al., 1994, Millen, 2000) in which brief but focused ethnographic studies are undertaken to provide a general but informed sense of the setting. As far as my study is concerned, the ethnography used will lie between these two approaches. My research will be focused and there will be periods of immersed participant observation throughout the study.

A commonly accepted definition of ethnography (Hammersley and Atkinson, 2007) is offered by focusing on what ethnographers do. The main features of what ethnography involves and how these relate to my own work follow:

- ***A strong emphasis on exploring the nature of a particular social phenomenon, rather than setting out to test hypotheses about them. Research takes place 'in the field'.*** In my study I will be exploring what takes place in a multipurpose technology-rich space by participating in its everyday reality.
- ***Data are gathered from a range of sources but, participant observation and informal conversations are usually the main ones.*** Likewise, in my study the collected data will consist of copious fieldnotes, photos, documents and recordings from participant observation and casual conversations
- ***A tendency to work primarily with 'unstructured' data; that is, data that have not been coded during the data collection process and do not follow a fixed, a priori research design.*** Similarly in my case, all activities observed will be considered as 'strange'; no preliminary hypotheses will be formed beforehand and no particular feature of use or interaction will be given a priori significance.
- ***Investigation of a small number of cases, perhaps just one case in detail.*** My study will focus on investigating the interactions that take place in one technology-rich multipurpose space.
- ***Analysis of data involves explicit interpretation, of the meanings and functions of human actions, the product of which mainly takes the form of verbal descriptions and explanations, quantification and statistical analysis playing a subordinate role at most.*** Similarly to the pilot study, for my main study, data will be analysed in terms of prevailing themes – narratives - and existing tensions between actual and anticipated use.

To recap, in terms of methodology, my study will follow the ethnographic approach. I will be a participant observer in the everyday life of a multipurpose technology-rich space, which basically entails observing what happens, participating in the activities, listening to what is said and having naturally occurring talks (casual conversations) with the parties involved (Becker and Geer, 1957: 28). The collected data will comprise primarily of fieldnotes deriving from the participant observation and casual conversations, and will occasionally be complemented by photos, documents and recordings. As expected, data are not unproblematically extracted from the setting, but generated through an

encounter between that setting and the ethnographer; as Diana Forsythe commented, *an ethnographer is not a tape recorder* (Forsythe, 1989). It will not be possible to collect all the data available; the focus will be on interactions and behaviours.

For the data analysis, I plan to follow the strategies that I used previously in my pilot study. In my pilot study, the analysis was focused on unveiling the emerging themes which were then described in terms of discrepancies between expected and actual use of the space. Similarly, for my main study, I will focus on the prevailing themes of the everyday use of the space; I will look into the way the space is used and compare it with what was originally planned or designed for. For example, one theme that is emerging in the first study of InQbate is that the managers view the space as designed primarily to support different forms of creativity. The technologies, the furniture, the lighting and the furnishings have all been designed to facilitate various creative activities. My analysis will examine how the various configurations of space, technology and people encouraged (or not) different forms of creative activities and what these are. Moreover, emphasis will be given to the interpretation of tensions, breakdowns and fire-fighting that may occur during the observational period. In this way, my analysis will provide a detailed narrative of the observed setting. Once a detailed analysis of the discourse, interactions and actions have been conducted an account will be developed detailing how the technologies and the space were used for the specific activity of a workshop. The criteria for completion of this first empirical study will be a satisfactory account of this particular activity that can be generalised to other planned uses of the setting. It is envisioned that 3 or 4 studies of the setting being used for different purposes will be carried out (e.g. a workshop, a student class, a business creativity session) over the six month period. Each specific use will be analysed using the criteria developed from the previous studies to compare and contrast how the different activities use the same space.

In respect of the research outcomes, my aim is to provide a better understanding of how multipurpose technology-rich spaces are appropriated. Due to the nature of the methodological approach, my findings are situated and tied to the context of the specific setting; nevertheless, achieving a rich description and understanding of the setting will provide the insight to know what are the limitations to what has been observed and whether this knowledge is

transferable to other similar settings. Hopefully, the transferable knowledge will provide guidelines that will assist in the future design of similar spaces.

Appropriateness of the ethnographic approach for the research question

This research aims to understand the realities of the everyday use of technology-rich spaces and to ascertain whether the realities of a given setting conform to the conceptions and/or aspirations that the designers or the managers of the space have. This research is concerned with unpicking specific aspects of particular settings in which space, people and technology for multiple uses are met.

First, the way people act and interact in spaces can be part of their everyday routine, and thus, it is often not recognized consciously by actors themselves. In this respect, the ethnographic approach provides the benefit of combining data collected from observation and semi-structured interviews. Second, there is a need to understand the ways people experience and appropriate these spaces; participant observation provides the advantage of the researcher experiencing first-hand what the observees do. Third, another important issue for understanding this interplay between spaces, technology and users are the ideas experienced by designers or managers when trying to design/manage multipurpose spaces to promote creativity, informal learning and collaboration. Their ideas and actions can affect vitally the use of the spaces. For the ethnographer-researcher, managers and/or designers are gatekeepers of the setting under study and a relationship must be established with them in order to gain access. This relationship is dynamic and renegotiated throughout the study and although sometimes it can prove problematic (Hammersley and Atkinson, 2007), most of the time, it gives the researcher a unique insight into the managers'/designers' ideas, feelings, aspirations and concerns about the space and its use. Finally, to understand the effects of the jointly physically, socially and technologically constructed environment, a holistic and interpretive approach can provide insights and offer a rich picture of the setting.

Ethnography, as a research method, is directed toward the production of a rich and concrete description of the situation, rather than an abstract and general one. Studies from different fields of practice, taking on ethnography as their

methodological approach, stress the significance of such rich descriptions (e.g. O'Brien et al. 1999; Ormerod et al., 2004; Pattillo-McCoy, 1999; Robinson, et al., 2007). Ethnography cites items, incidents, activities or practices within their context, to emphasise that their meaning is properly comprehended within the appropriate social context. Moreover, ethnography not only interviews the participants or observes the setting but does so through the eyes of those who inhabit it, by participating. The outputs can be understood in terms of the interplay between members and the ethnographer. These features - immersive, detailed, combinative and contextual - are the reasons of undertaking ethnography for this particular research.

Section 5 Empirical Work

This section reports on previous empirical work. An observational fieldwork study of a technology-rich multipurpose environment was carried out during the first months of my research and served as a pilot study to my following work. The aim of the study was to observe how people used and appropriated the physical space, the technology embedded in it and each other in D-space, a technology-rich multipurpose space which was recently created as a new facility for a university library. Specifically, D-space is “a creative play area to experiment with and explore new ideas and share knowledge”, a space that “brings together new technologies and ideas on how they could be used for learning and teaching now or in the future”. The study, carried out over a period of two months, revealed tensions between the anticipated and actual use. The methodological approach was ethnographic, involving participant observation of naturally occurring use and interaction together with semi-structured interviews with participants. The observations were carried out two to three days a week over a period of two months. The whole spectrum of daily activity was covered, with observing sessions in the morning, noon-early afternoon and late afternoon. Activity and use was recorded by copious field notes. A sociogram was created to help capture multiple interactions and movements through space and time. The semi-structured interviews, involved one of the managers of the space, a regular user and six first-time users. The empirical work and the findings were presented and published as a student paper in the British HCI2008 Conference (see appendix).

The overall findings from the interviews and observational sessions showed that the space was not used in the way anticipated. Users of the space had a preference for using it primarily as a private meeting room. Observations revealed behaviours (the *creating corners* pattern) that did not promote socialising and collaboration. Furthermore, the actual use of the technologies was limited. My analysis and findings were presented as three themes between proposed use and actual use: i) public versus private, ii) play space versus meeting room, iii) technology use versus non-use. The themes are articulated in terms of tensions between the rhetoric (the stated hopes, ambitions and intentions) of the space and the observed reality of its day-to-day use.

Section 6 Work Plan

This section outlines the overall work plan proposed for the delivery of the PhD to meet the research objectives and outcomes stated in section 2 using the methodology described in section 4.

Firstly, the overall schedule is presented as a simplified Gantt chart. The plan is accompanied by notes explaining the tasks and highlighting the decisions made regarding their scheduling. Moreover, other considerations such as costs and equipment are noted.

Overall Schedule

This schedule is divided into six main tasks that should be carried out between January 2008 and December 2010, giving a total of 36 months. These tasks are:

- **Literature Review:** continues throughout the PhD process up to the viva itself
- **Pilot Study:** already completed. It started in February 2008 involving the collection of data from observations, casual conversations and semi-structured interviews. The collection of data ended in April 2008. The analysis of the collected data started in March 2008 and continued until May 2008.
- **Paper Writing:** already completed. The paper reported on the findings of the pilot study and was presented in the HCI 2008 Conference.
- **Main Study Preparation:** already completed. The preparation involved a series of meetings between the managers of the InQbate and myself; their purpose was for providing information about the study and negotiating access.
- **Main Study:** began in September 2008. The first study will be gathered from an ethnographic study of the Shareable Interfaces for Learning Workshop that took place at the InQbate at Sussex University on the 10th and 11th of September. The analysis of the collected data will begin approximately in October 2008 and the interpretation will follow one month later. The main study in the space is expected to end around May 2009.

- **Follow-up studies:** their nature and content will be decided upon the findings of the main study. Their expected duration is between May and November 2009.
- **Thesis Writing:** begins in December 2009 and is expected to end in October 2010. This will allow two months for the external examiners to read it before the viva.
- **Viva Preparation:** will begin in the final stages of the previous task (thesis writing) and will end in December 2010 with the final viva presentation.

The following chart, figure 1, shows the proposed work schedule:

Work Schedule

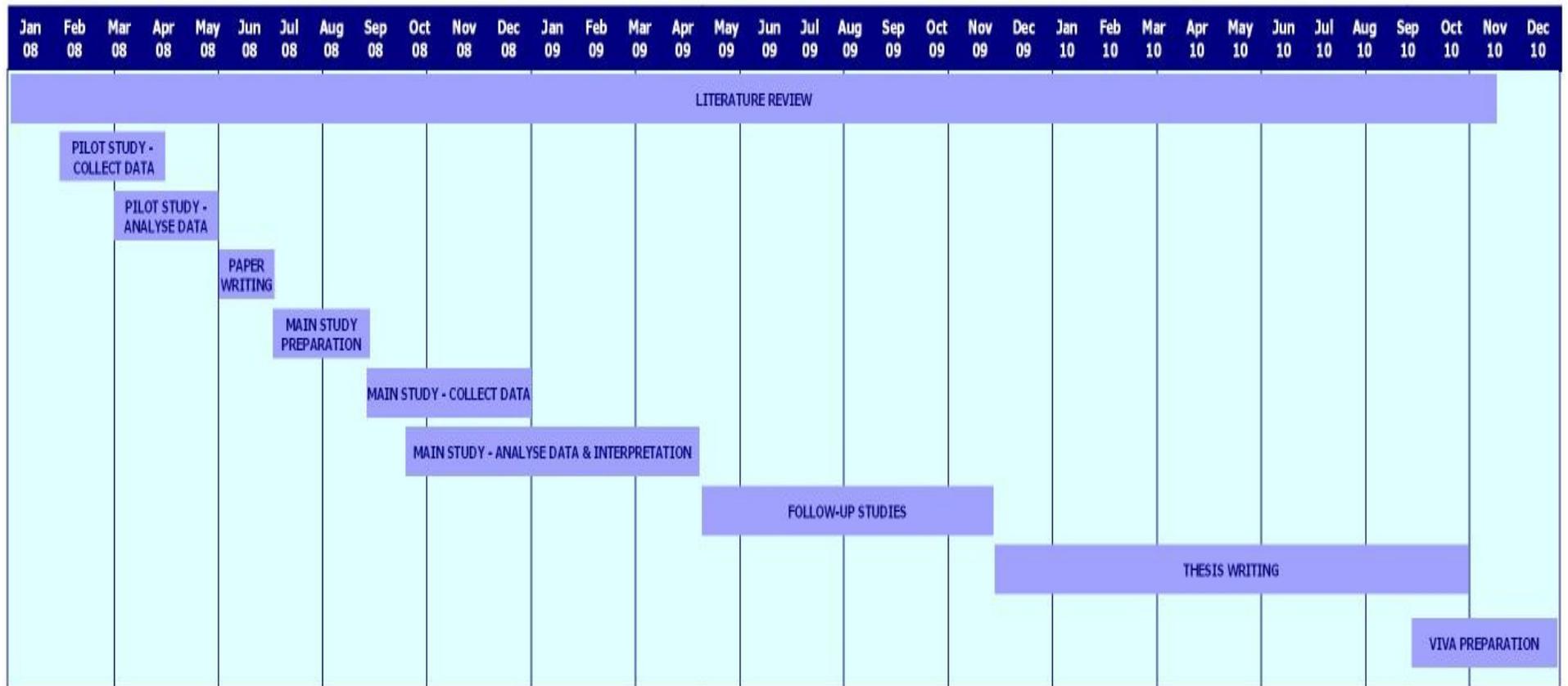


Figure 1 PhD Schedule

Other Considerations

The plan does not show any communication tasks, such as attending conferences or writing papers. Sufficient time has been left in the schedule to allow the completion of the tasks, though their exact timing cannot be shown as it is not known currently.

The project requires occasional use of dedicated equipment such as audio or video recorders, analysing software etc. Also, there are issues regarding accommodation and travelling expenses as most of the studies will take place in locations away from Milton Keynes. Therefore, there are costs arising to the project from the above two considerations.

Moreover, there are some key risks to the work schedule. A major risk factor is granting access to the setting of the study. For the main study, initial access is granted by the gatekeepers of the space but in ethnographic studies access is always renegotiated throughout the data collection phase (Hammersley and Atkinson, 2007). The same issue rises regarding the follow-up studies. In case of delay or denial of access to the setting, the work schedule would have to be rethought.

Section 7 References

- Becker, H. S., and Geer, B. (1957). Participant observation and interviewing: a comparison, *Human Organization*, 16(3), 28-32.
- Berker, T., Hartmann, M., Punie, Y., and Ward, K. (Eds.) (2006). *Domestication of media and technology*. New York: The Open University Press.
- Brignull, H., and Rogers, Y. (2003). Enticing people to Interact with large public displays in public spaces. Proceedings of INTERACT'03: *Ninth IFIP TC13 International Conference on Human-Computer*. Zurich, Switzerland: IOS Press.
- Brignull, H., Izadi, S., Fitzpatrick, G., Rogers, Y., and Rodden, T. (2004). The introduction of a shared interactive surface into a communal space. Proceedings of CSCW 2004: *Conference on Computer Supported Cooperative Work*. Chicago, USA: ACM Press.
- Churchill, E.F., Nelson, L., Denoue, L., and Girgensohn, A. (2003). The Plasma Poster Network: Posting multimedia content in public places. Proceedings of INTERACT'03: *Ninth IFIP TC13 International Conference on Human-Computer*. Zurich, Switzerland: IOS Press.
- Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Q* 13(3), 319-340.
- Forsyth, D.R. (2006). *Group dynamics* (4th edition). Belmont, CA: Thomson/Wadsworth.
- Forsythe, D. (1989). It's just a matter of common sense: Ethnography as invisible work. *Computer-Supported Cooperative Work*, 8(1-2), 127-145.
- Foucault, M. (1967/1984/1986). Of other spaces. In *Diacritics*, 16(1), 22-27.
- Glasgow Caledonian Learning Café (2008). Retrieved from: <http://www.jisc.ac.uk/media/documents/publications/learningspaces.pdf> .
- Goffman, E. (1961). *Encounters: Two studies in the sociology of interaction*. Indianapolis: Bobbs-Merrill.
- Goffman, E. (1963). *Behaviour in public places: Notes on the social organization of gatherings*, New York: Free Press.
- Grasso, A., Muehlenbrock, M., Roulland, F., and Snowdon, D. (2003). Supporting communities of practice with large screen displays. In O'Hara, K., Perry, M., Churchill, E., and Russell, D. (Eds.), *Public and situated displays: Social and interactional aspects of shared display technologies* (pp.261-283). Dordrecht, The Netherlands: Kluwer Academic.
- Hammersley, M., and Atkinson, P. (2007). *Ethnography: Principles in practice* (3rd edition), London: Routledge.
- Hertzberger, H. (2000). *Space and the architect: Lessons in architecture 2*. Rotterdam: Uitgeverij 101.

Huang, E. M., Mynatt, E. D., and Trimble, J. P. (2007). When design just isn't enough: The unanticipated challenges of the real world for large collaborative displays. *Personal and Ubiquitous Computing, Special Issue on Ubiquitous Computing in the Real World*, 11(7), pp. 537-547.

Huang, E. M., Koster, A., and Borchers, J. (2008). Overcoming assumptions and uncovering practices: When does the public really look at public displays?. Proceedings of Pervasive 2008: *6th International Conference of Pervasive Computing*. Sydney, Australia: Springer.

Hughes, J., King, V., Rodden, T., and Anderson, H. (1994). Moving out from the control room: Ethnography in system design. Proceedings of the 1994 ACM: *Conference on Computer Supported Cooperative Work*, Chapel Hill, North Carolina: ACM Press.

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

InQbate (2008). Retrieved from: <http://www.inqbate.co.uk/> .

Izadi, S., Brignull, H., Rodden, T., Rogers, Y., and Underwood, M. (2003). Dynamo: A public interactive surface supporting the cooperative sharing and exchange of media. Proceedings of UIST 2003: *Symposium on User Interface Software and Technology*. Vancouver, Canada: ACM Press.

Khine, M.S., and Fisher, D. (2003). *Technology-rich learning environments: A future perspective*. Singapore: World Scientific Publishing.

Levine, J.M., and Moreland, R.L. (Eds.) (2006). *Small groups: Key readings in social psychology*. New York: Psychology Press.

Mackay, H., and Ivey, D. (2004). *Modern media in the home: An ethnographic study*. Rome: John Libbey-CIC.

McDonald, D.W., McCarthy, J.F., Soroczak, S., Nguyen, D.H., and Rashid, A.M. (2008). Proactive displays: Supporting awareness in fluid social environments. *ACM Transactions on Computer- Human Interaction*, 14(4), Article 16.

Meyrowitz, J. (1985). *No sense of place: The impact of electronic media on social behaviour*. New York: Oxford University Press.

Millen, D. (2000). Rapid ethnography: Time deepening strategies for HCI field research. Proceedings of DIS 2000: *ACM Conference on Designing Interactive Systems Conference*. Brooklyn, New York: ACM Press.

Milne, A. J., and Winograd, T. (2003). The iLoft Project: A technologically advanced collaborative design workspace as research instrument. Proceedings of ICED'03: *13th Annual International Conference on Engineering Design*. Stockholm, Sweden.

Mitchell, J.W. (interviewee) and Syllabus (interviewer). (2003). *Designing the Space: A Conversation with William J. Mitchell*. *Campus Technology*. Retrieved from: <http://www.campustechnology.com/article.aspx?aid=39465>

Monahan, T., (2001). The Analog Divide: Technology practices in public education. *Computers & Society* 31(3), pp. 22-31.

O'Brien, J., Rodden, T., Rouncefield, M., and Hughes, J. (1999). At home with the technology: An ethnographic of a set-top-box trial. *ACM Transactions on Computer-Human Interaction*, 6(3), pp.282-308.

O'Hara, K., Perry, M., Churchill, E., and Russell, D. (Eds.) (2003). *Public and situated displays: Social and interactional aspects of shared display technologies*. Dordrecht, The Netherlands: Kluwer Academic.

O'Hara, K., Glancy, M., and Robertshaw, S. (2008). Understanding collaborative play in an urban screen game. (To appear in) *Proceedings of CSCW'08: The 2008 ACM Conference on Computer Supported Cooperative Work*. San Diego, California.

Ormerod, T.C., Mariani, J., Morley, N.J., Rodden, T., Crabtree, A., Mathrick, J., Hitch, G., and Lewis, K. (2004). Mixing research methods in HCI: Ethnography meets experimentation in image browser design. *Proceedings of EHCI-DSVIS'04: The 9th IFIP Working Conference on Engineering for Human-Computer Interaction jointly with The 11th International Workshop on Design, Specification and Verification of Interactive Systems*. Hamburg, Germany.

Pantidi, N., Robinson, H. M., and Rogers, Y. (2008). Can technology-rich spaces support multiple uses?. *Proceedings of HCI2008: The 22nd annual conference of Interaction, a specialist group of the British Computer Society*. Liverpool, UK: BCS.

Pattillo-McCoy, M. (1999). *Black picket fences: Privilege and peril among the black middle class*. Chicago, IL: University of Chicago Press.

Peltonen, P., Kurvinen, E., Salovaara, A., Jacucci, G., Ilmonen, T., Evans, J., Oulasvirta, A., and Saarikko, P. (2008). It's mine, don't touch! : Interactions at a large multi-touch display in a city centre. *Proceedings of CHI '08: Conference on Human Factors in Computing Systems*. Florence, Italy: ACM Press.

Robinson, H. M., Segal, J., and Sharp, H. (2007). Ethnographically-informed empirical studies of software practice. *Information and Software Technology*, 49(6), pp. 540-551.

Russell, D. M., and Sue, A. (2003). Large interactive public displays: Use patterns, support patterns, community patterns. In O'Hara, K., Perry, M., Churchill, E., and Russell, D. (Eds.), *Public and situated displays: Social and interactional aspects of shared display technologies* (pp. 3-18). Dordrecht, The Netherlands: Kluwer Academic.

Saltire Centre, (2008). Retrieved from: http://www.jisc.ac.uk/media/avfiles/programmes/elearning_innovation/saltire_wm.wmv .

Sigman, S. J. (Ed.) (1995). *The consequentiality of communication*. Hillsdale, NJ: Erlbaum.

Streitz, N., Geißler, J., Holmer, T., Konomi, S., Müller-Tomfelde, C., Reischl, W., Rexroth, P., Seitz, R., and Steinmetz, R. (1999). i-Land: An interactive landscape for creativity and innovation. *Proceedings of CHI'99: ACM Conference on Human Factors in Computing Systems*. New York: ACM Press.

Streitz, N., Prante, T., Roker, C., van Alphen, D., Magerkurth, C., Stenzel, R., and Plewe, D. (2003). Ambient displays and mobile devices for the creation of social architectural spaces: Supporting informal communication and social awareness in organisations. In O'Hara, K., Perry, M., Churchill, E., and Russell, D. (Eds.), *Public and situated displays: Social and interactional aspects of shared display technologies* (pp. 387-409). Dordrecht, The Netherlands: Kluwer Academic.

Taylor, M. (1994). Ethnography, In Banister, P., Burman, E., Parker, I., Taylor, M. and Tindall, C. (Eds.), *Qualitative Methods in Psychology: A Research Guide* (pp. 34-48). Buckingham: Open University Press.

Trimble, J., Wales, R., and Gossweiller, R. (2003). NASA's MERBoard, In O'Hara, K., Churchill, E., and Russel, D. (Eds.), *Public and situated displays: Social and interactional aspects of shared display technologies* (pp. 18-45). Dordrecht, The Netherlands: Kluwer Academic.

Tschumi, B. (1996). Architecture and limits III, In Nesbitt, K. (ed.), *Theorizing a new agenda for architecture: An anthology of architectural theory 1965-1995* (pp. 156-162) (2nd ed.). New York: Princeton Architectural Press.

Appendix

Pantidi, N., Robinson, H. M., and Rogers, Y. (2008). Can technology-rich spaces support multiple uses?. Proceedings of HCI2008: The 22nd annual conference of Interaction, a specialist group of the British Computer Society. Liverpool, UK: BCS.

Can Technology-rich Spaces Support Multiple Uses?

Nadia Pantidi
The Open University
Walton Hall
Milton Keynes MK7 6AA UK

Hugh Robinson
The Open University
Walton Hall
Milton Keynes MK7 6AA UK

Yvonne Rogers
The Open University
Walton Hall
Milton Keynes MK7 6AA UK

k.pantidi@open.ac.uk

h.m.robinson@open.ac.uk

y.rogers@open.ac.uk

ABSTRACT

A number of technology-rich spaces have been designed and created over the last few years with the purpose of supporting and enhancing learning, collaboration, community participation and a variety of everyday activities. Our research is concerned with how such spaces are used and whether they can support multiple uses. We report on an observational fieldwork study of a technology-rich multipurpose space based in a library. We examine its everyday use and discuss the tensions that were revealed in our analysis between anticipated and actual use. These are: (i) public versus private, (ii) play space versus meeting room and (iii) technology use versus non-use.

Keywords

Technology-rich spaces, multipurpose, ethnographic study.

1. INTRODUCTION

In the last few years, many 'technology-rich' spaces have been proposed as examples of future places for learning, working and socialising e.g., (Oblinger, 2006; JISC, 2006). *Learning and teaching spaces*, such as classrooms and auditoriums, have been embedded with a diversity of new technologies, such as tablet PCs, whiteboards (Razmov, 2006), plasma screens, videoconferencing (CILASS), personal response systems and IP video systems (LeBaronHall Auditorium). A main aim is to promote collaborative learning through encouraging more interactions between students and teachers. *Workspaces* such as laboratories, meeting rooms and offices have been embedded with shared technologies such as tabletops, whiteboards, and wirelessly interconnected monitors to enable people to collaborate using a diversity of digital content (Streitz et al., 1999), (Stanford Group Spaces), (London Metropolitan Science Centre). Multi-user interactive surfaces e.g. (Izadi et al., 2003), interactive plasma displays e.g., (Churchill et al., 2003) and laptops and touch screens e.g., (Glasgow Caledonian Learning Cafe) have been placed in *social spaces*. Here, the intention has

been to reinforce mechanisms and interactions already in place to improve community participation.

Another type of technology-rich space that is beginning to appear is one that is designed to be *multi-purpose*. A main idea is to make the space adaptable and flexible to people's changing needs and activities (e.g., InQbate; Saltire Centre). An advantage is that the same space can be configured for a variety of work, social and learning activities and for different user groups. However, while the idea of multi-purpose spaces is very appealing little is known as to how they are used in practice.

This paper reports on an observational fieldwork study of a technology-rich multipurpose environment, D-space, recently created as a new facility for visitors to a university library. The aim of the study was to observe how people used and appropriated the physical space, the technology embedded in it and each other. The study, carried out over a period of two months, revealed tensions between the anticipated and actual use. The paper discusses these in view of whether multi-purpose, technologically-embedded spaces can work.

2. THE STUDY

The purpose of this study was to examine the reality of the everyday use of a multipurpose technology-rich space. The methodological approach was ethnographic (see, e.g., Fielding, 1993), involving participant observation of naturally occurring use and interaction together with semi-structured interviews with participants. The ethnographic approach ensured that the researcher attended to the taken-for-granted, accepted, and unremarked aspects of use and interaction, considering all activities as 'strange' so as to prevent prior assumptions and background from affecting their observations. No preliminary hypotheses were formed beforehand and no particular feature of use or interaction was given *a priori* significance.

The observations were carried out two to three days a week over a period of two months. The whole spectrum of daily activity was covered, with observing sessions in the morning, noon-early afternoon and late afternoon. Nevertheless, the majority of the data was gathered from the noon-early afternoon sessions, since the other two sessions revealed minimal activity. Activity and use was recorded by copious field notes. A schematic plan of the room was created to help capture any multiple interactions and movements through space and time.

© The Author 2007.

Published by the British Computer Society

The semi-structured interviews, involved one of the managers of the space, a regular user and several first-time users – individuals who had never been in the space before or had only been there once.

The technology-rich space was situated in the library area of a University Campus. At the time of the study, it had been open for some 15 months, and its presence and availability was still strongly promoted around the University. As stated in a

promotional leaflet, it is “a creative play area to experiment with and explore new ideas and share knowledge”, a space that “brings together new technologies and ideas on how they could be used for learning and teaching now or in the future”. The space measured 90m² and was situated at the far end (from the entrance) of the ground floor of the library. Its door is the first in a line of office doors and requires a key card in order to gain access. A big U-shaped couch in the centre of the room faces a

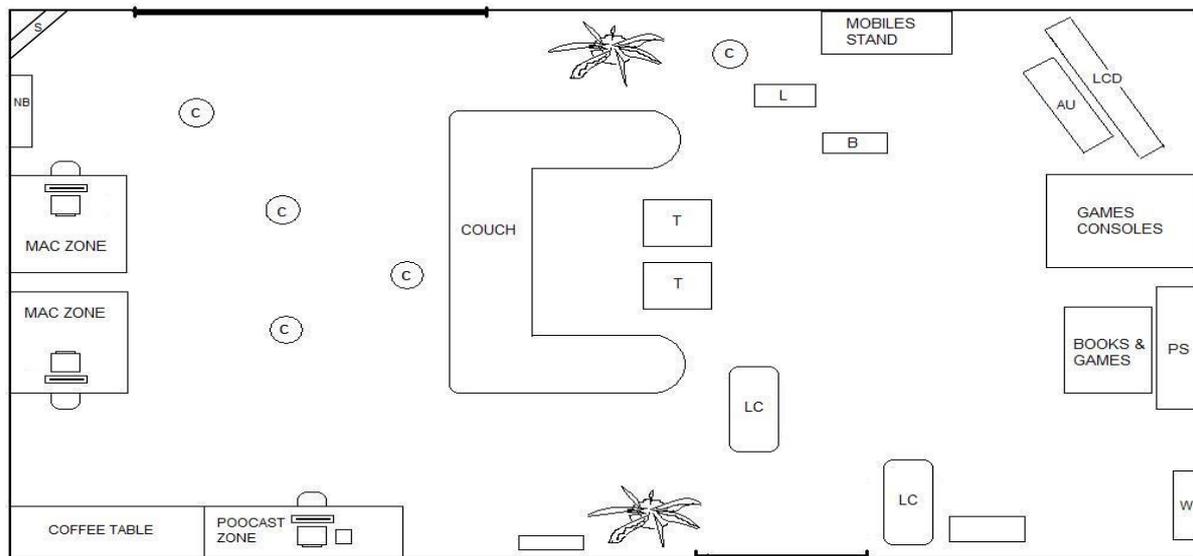


Figure 2. Schematic diagram of D-space: “C” stands for chairs, “LC” for lounge chairs, “T” for tables, “PS” for projector screen, “W” for whiteboard, “NB” for notice board, “L” for Lego’s, “B” for books, “S” for shelves, “AU” for audio devices and “LCD” for LCD screen. The peripheral bold lines indicate the entrance and the window.

projector screen, a whiteboard and an LCD screen (see Figure 1). There is a large collection of current video games consoles (e.g., Wii, Xbox, PSP, Nintendo DS), a coffee machine, three desks with personal computers, books and magazines on education and technology, video games and other ‘fun’ technology objects such (e.g., iPod, a Nabaztag rabbit, a robot), as well as a collection of high-tech mobile phones. On the walls, and adjacent to each technology, there are labels and instructions describing how to use them. From the outside, the view into the space is obscured by a locked door, walls and a one-way window. There are, however, a few small ‘port-hole’ windows.

The overall findings from the interviews and observational sessions revealed that the space was not used in the way anticipated. Users of the space had a preference for using it primarily as a private meeting room. Furthermore, the actual use of the technologies was limited. We present our analysis and findings as three themes between proposed use and actual use: i) public versus private, ii) play space versus meeting room, iii) technology use versus non-use. The themes are articulated in terms of tensions between the rhetoric (the stated hopes, ambitions and intentions) of the space and the observed reality of its day-to-day use.

Public versus private space?

Planned use: D-space was designed to be public: it is a drop-in space that has a non booking policy. It was created to encourage groups of people with different backgrounds to get in touch and communicate their interests or their work in a neutral but yet cosy environment. The library was chosen for this purpose

because it is a common building that “shelters” people from all departmental affiliations and issues of status. The space, in theory, accommodates teamwork and collaboration. The furniture is multifunctional and flexible; users have the freedom in reconfiguring –at least partly- the physical environment (chairs, tables). Display technologies are available for large groups of people.

Actual use: Was the space really public and did it support collocated action and collaboration? The observed use and activities that took place showed contradicting public versus private usage patterns of the space.

Demonstrating its public nature, there were times when the room was shared unobtrusively by two different groups having separate casual meetings and by one individual working at a PC at the same time when a group of two or three people were having a meeting. But, on the other hand, facial expressions, annoyed looks, stares and body language were indicators that there were times where users were disturbed by the presence of others. In most of the occasions where two groups of people (it was also the same for the case of one individual and one group) were coexisting in the space at the same time, two behavioural patterns were observed: whispering and “creating corners”. Creating corners describes both the tendency of each group to be physically isolated in a corner of the room and also, when this was not possible, the tendency of groups to create corners where they did not exist, e.g., the couch. Even when the individuals/groups weren’t “creating corners”, they spoke in a low voice or whispered, suggesting that they didn’t want to disturb the other group/person or because they didn’t want to be heard. Moreover, there were occasions where people left the

space because somebody was already there and returned immediately after the first group had left. This can be interpreted as the people not being comfortable sharing the space and also that there was some sort of ownership attributed to the pre-existing group in relation to the space.

One of the managers of the space mentioned that although she was afraid that there might be conflicts and complaints between groups, so far it seems *“to be working really well and people don't mind sharing the space with others”*. Regular users of the space know that it is public and one interviewee also proclaimed that she enjoys that: *“No, I find it stimulating; I don't mind if there are other people there or them overhearing- I overhear sometimes! When I want to talk about something really private I go to other places e.g. meeting rooms. But most of our meetings are not that formal, they are more casual”*. On the other hand, non users or occasional users, all, with one exception, agreed during the interviews that it *“doesn't feel as a public space”, “it feels like a controlled room”, “it feels like a room that you have to book”, “it feels like a space designated for specific groups of people”*. When asked if they thought that the space can support collocated action, all of them replied that it depends on the activities involved and suggested that it would be feasible for quiet activities that do not involve more than two groups of people. Also, all of the participants commented that if one group uses the data projector and couch area for any type of activity, the coexistence of other group activities automatically gets more difficult or even impossible. Moreover, two of the participants stated clearly that if they entered the space and another group was already there, they would leave because it felt like they were interrupting and conversely, they would feel interrupted in a similar occasion.

The small size of the room meant that it did not favour many simultaneous group activities. When the interviewees were told that the space is a public, non-bookable space, they wondered about the need for a key card to enter. They tried to link the “public” attribute of the space with the already known public nature of the library building. A suggestion of changing the non-booking policy to booking also came up during the interview with the manager, who mentioned she gets requests from people to book the space for private activities or meetings (*“we do get requests from people to book the room and I always go back to them and explain that we do have a non booking policy, (...)and they are usually fine with that and they will either come back and say we understand and still come and use the room or they will find a meeting space that they can book”*).

Play space versus meeting room?

Planned use: The designers had planned the space to be a place to experiment with the various technologies, and to consider how they might support learning and studying activities, for example, using Wii, Second Life or the robot. As stated by the manager, the aim was to provide *“a creative play space with examples of technologies that could have educational application so that people could come in and have hands on, and have a play and just get familiar with”*.

Actual use: The space was used primarily as a meeting room and not in the intended way as a play space. In more than half of the observed cases, the space was used as a cosy meeting room; small groups of people sat on the couch or the comfortable chairs, discussing personal and work related subjects while having coffee. The majority of the observed uses was of people reading, being interviewed, having coffee or

working in the PC area. Only twice in the period of two months was it used as a play space: both times two/three students were playing with the Wii console during or after their lunch break. There were also several occasions where people came in to the space with the intention of playing but were deterred by an informal meeting that was already in progress.

The observational data reveal a pattern of use that is not consistent with the originally intended use of the space. However, a selection of responses stemmed from the interviews with infrequent users. When asked to give a label to the room, they replied i) meeting room (three of them), ii) play space (two of them) and iii) mixed lounge room (one of them). It appears that their answers were guided from what was happening in the space when they were using it. For example, the regular user's response when asked what she usually does in the space when visiting replied: *“Chatting at lunch breaks; mainly informal meetings with co-workers to talk about running projects and planning papers. Recently, I used the projector to do a dry run of a presentation in one of my supervision meetings”*. She also added that she has never used any of the game consoles and that she doesn't intend to because she is not interested (*“I was never a gamer”*).

Technology use versus non-use?

Planned use: The technology was placed into the space to encourage visitors to try them out by themselves. To help those not familiar with the technologies various guides and instructions were provided.

Actual use: Our observations showed that the visitors were often intimidated and afraid of touching the technology inside the space. The most used technology was the computers. These were used mainly by individuals. When groups were involved, they used the computers to do a presentation or to make information visible for the whole group.

There were occasions when people entered the space very enthusiastically to try out all the technologies. They interacted with most of them (game consoles, mobiles, computers, iPod) but did not get very far with getting them to work. They read the relevant instructions and retried but failed again and finally ended up calling the manager for assistance. In the interview, the manager acknowledged: *“...after a couple of events where we invited people to come and have a look around, we realised that there were a lot of users who were really scared of touching anything unless there was someone there to explain it to them, so we started offering facilitator staff sessions”*. What the manager described vividly as “really scared” is only one aspect of how people feel when trying to interact with the technology; another aspect, as the observation showed, is feeling incompetent.

The infrequent users reported feelings of incompetency even though they were familiar with the technology in the space. They had used most of the applications in the past and some quite regularly. Despite their acquaintance and previous experience, they were not able to work out how to use the same technology in the space.

These findings suggest that although cosy and comfortable, the affordances of the space lack inviting clues that would encourage users to know how to interact with the technology. Instead, the technology appears more like a shop window display that looks nice but cannot be touched. Finally, the study has shown how people will often appropriate technology for their own rather than intended use.

3.CONCLUSION

Our study has shown how a multi-purpose technology-rich space, situated in a university library, was used in different ways from how it had been anticipated. Rather than being used to experiment with a diversity of new technologies to think about their implications for supporting learning, it was appropriated primarily as a meeting space. Furthermore, very little of the available technology was played with.

Various tensions exemplify this discrepancy between the anticipated and actual use of the space. For example, despite the way the technologies were visibly laid out to be 'on display', - with highly visible printed instructions next to them inviting visitors to try them out, the participants were often uncertain, and at times appeared to be intimidated by the choice on offer. Instead, they preferred to stay in their comfort zone, by appropriating familiar uses of the technology and physical space; for example, sitting on the sofa, using the data projector to have a meeting.

Why do such tensions arise between anticipated and actual use? One reason is that we often fail to notice the ways in which space constrains or enhances what we intend to accomplish, because we habitually take space arrangements for granted. Strange and Banning (Strange, 2002) asserted that "although features of the physical environment lend themselves theoretically to all possibilities, the layout, location, and arrangement of space and facilities render some behaviours more likely and thus more probable than others". This appears to have been what happened with D-space; its location, the arrangement of the space and the technology rendered it more of a private meeting room than a public play space. The locked door, the walls, the one-way window, all contributed to creating a "private effect" and in turn, the visitors constructed their own private identity of the space.

The way groups "created corners" even in round and open ended spots in D-space suggested an uncomfortable coexistence of two or more parties in the same physical space. Such awkwardness did not lend itself to spontaneous interaction and collaboration between the groups. The way the regular visitors used the space might also have set an example to others, suggesting how it should be used. It is well known how people establish behavioural routines according to the space they are in and depending on the existence/absence of other people. Furthermore, the strong associations with a library space may have made it awkward for people to feel at ease playing computer games in it - albeit to consider how they might be used to support learning in various ways.

Thus, it appears that multi-purpose technology-rich spaces, such as D-space, can be ambiguous to onlookers, sending out mixed

messages as to how to use them. On the one hand, they provide many visual cues of what is on offer that can be tempting to have a look at. On the other hand, they may not offer enough clues or direction about their usage, making it difficult to know how to behave. D-space was full of cues and clues but which appeared to be counter-productive, as astutely observed by one of the interviewees: "it is schizophrenic, not sure what it is". It maybe that technology-rich spaces that are designed with a specific purpose in mind (e.g., a social gathering place to watch and interact with large screen broadcasts) are more successful than those that are designed to be multi-purpose, providing many ways of using them but in underspecified ways – another example of the paradox of choice where less may be more (Schwartz, 2004).

4.REFERENCES

- Churchill, E.F., Nelson, L., Denoue, L., and Girgensohn, A. "The Plasma Poster Network: Posting Multimedia Content in Public Places." *Proceedings of INTERACT 2003, Ninth IFIP TC13 International Conference on Human-Computer*. Zurich, Switzerland: IOS Press, 2003. 599-606.
- CILASS:http://www.jisc.ac.uk/media/avfiles/programmes/learning_innovation/cilass_wm.wmv.
- Fielding, N. "Ethnography." In *Researching Social Life*, by N. Gilbert. Sage, 1993.
- Glasgow Caledonian Learning Café:
<http://www.jisc.ac.uk/media/documents/publications/learningspaces.pdf>.
- InQbate: <http://www.inqbate.co.uk/>.
- Izadi, S., Brignull, H., Rodden, T., Rogers, Y., Underwood, M. "Dynamo: A public interactive surface supporting the cooperative sharing and exchange of media." *Proceedings of UIST 2003, Symposium on User Interface Software and Technology, November 2-5*. Vancouver, Canada: ACM Press, 2003. 159-168.
- JISC, e-Learning and Innovation Team. "Designing spaces for effective learning." *Proceedings of JISC Conference 2006*. 2006.
- LeBaronHall Auditorium:
<http://www.educause.edu/Chapter22.IowaStateUniversity%3ALeBaronHallAuditorium/11920>.
- London Metropolitan Science Centre:
http://www.jisc.ac.uk/media/avfiles/programmes/elearning_innovation/science_centre_qt.mov.
- Oblinger, D. *Learning Spaces*. Educause, 2006.
- Razmov, V., Anderson, R. "Pedagogical Techniques Supported by the Use of Student Devices in Teaching Software Engineering." *Proceedings of 37th ACM SIGCSE Technical Symposium on Computer Science Education*. Houston, Texas: ACM Press, 2006. 344-348.
- Saltire Centre:
http://www.jisc.ac.uk/media/avfiles/programmes/elearning_innovation/saltire_wm.wmv.
- Schwartz, B. *The Paradox of Choice: Why More is Less*. Ecco, 2004.
- Stanford Group Spaces:
<http://www.educause.edu/Chapter35.StanfordUniversity%3AGroupSpaces/11933>.

Strange, C.C., and Banning, J.H. "Educating by Design: Creating Campus Learning Environments That Work." San Francisco: Jossey-Bass, 2002.

Streitz, N., Geißler, J., Holmer, T., Konomi, S., Müller-Tomfelde, C., Reischl, W., Rexroth, P., Seitz, R., and

Steinmetz, R. "i-Land: An Interactive landscape for creativity and innovation." *Proceedings of CHI'99 ACM Conference on Human Factors in Computing Systems*. New York: ACM Press, 1999. 120-127.