

Open Research Online

The Open University's repository of research publications and other research outputs

An Ethnographic Study of Everyday Interactions in Innovative Learning Spaces

Thesis

How to cite:

Pantidi, Nadia (2013). An Ethnographic Study of Everyday Interactions in Innovative Learning Spaces. PhD thesis The Open University.

For guidance on citations see [FAQs](#).

© 2013 Nadia Pantidi

Version: Version of Record

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's [data policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

AN ETHNOGRAPHIC STUDY OF
EVERYDAY INTERACTIONS IN
INNOVATIVE LEARNING SPACES

A thesis submitted to The Open University

for the degree of

Doctor of Philosophy in Computing

by

Nadia Pantidi

2013

Abstract

For the last 10 years universities and colleges in the UK have generated significant investment in designing innovative learning spaces. These spaces have been created to accommodate a student-centered pedagogical approach that is intended to promote formal and informal learning activities, collaboration and socializing by means of flexible technological infrastructure and architectural design.

Various assessments have already been realized to investigate the outcomes of this investment and the impact of those spaces on learning. Yet, there is a persevering need to better understand the role of the technological infrastructure and the architectural design in innovative learning spaces as a lived experience by those who use and inhabit them; and to establish whether they are used as anticipated. This work takes up on this challenge and investigates three innovative learning spaces through an ethnographic approach that, following the analytic orientation of Suchman's situated action, considers and juxtaposes anticipated versus actual use. More specifically, this work addresses the following research questions:

- How do people interact with the architectural and technological infrastructure and with each other in innovative learning spaces on an everyday basis?
- How do everyday interactions compare with those envisioned by the designers and managers of these spaces?
- How do we account for the differences between actual and anticipated use of the spaces?
- How can spaces be designed or recover from breakdowns so that actual and anticipated use (re) align?

By addressing those questions, the present work contributes to an empirically-grounded understanding of how innovative learning spaces are being used and appropriated compared to the envisioned usage. The analysis reveals tensions between actual and anticipated use, the situated nature of flexible design, as well as the complex and contested processes through which interactions in innovative learning spaces are accomplished, adapted or superseded.

The findings suggest a set of critical factors that account for the tensions between desired and actual use of such spaces. Issues of legibility, legitimacy and sense of ownership and appropriation supersede the existing views and guidelines of adaptable design as presented in the current literature and can be used to inform the design and evaluation of innovative learning spaces.

Acknowledgements

I would like to express my gratitude to a number of people whose contribution and support made this work possible.

First and foremost, my supervisors for their unconditional mentoring, continuous support and for bearing with me for five years:

Prof Yvonne Rogers, thank you for believing in me from the very beginning, for giving me the opportunity to make this dream come true and for supporting me from day one until the end.

Prof Hugh Robinson, thank you for believing in me and for pushing me to get better every day. Our discussion and debates will be very much missed.

Second, my friends for being always there for me and for keeping me sane.

Jen, thank you for being a great co-traveller these five years; your comments and support were essential to this work.

Paul, Ben, Susie, Rickie, Khaled, Stuart thank you for your friendship and support and mostly for making UK feel like home.

Apostoli, Thomy, Mara, George, Valia, you have been my chosen family for many years now; without you I would have never made it here.

My other friends, colleagues and co-travellers from the Open University and in particular Minh, Jo and Koula for being there in good and bad times.

Finally, I would like to thank my family for their continuous support, my examiners for their feedback and The Open University for funding my research.

A special mention to my dad for passing on to me his intellectual restlessness.

List of Related Publications

Some of the research described in this dissertation has been presented and published in the following venues.

The findings regarding the use of technology across all three settings have been accepted to be published in a special issue of IEEE MEEM on technology enhanced learning spaces:

Pantidi, N., Rogers, Y., and Robinson, H.M. Exploring the Use of Technology in Innovative Learning Spaces, (to appear in: IEEE Multidisciplinary Engineering Education Magazine (IEEE MEEM), in press)

Findings from Chapter 4 and Chapter 5 have been presented in the workshop 'Appropriation and Creative Use: Linking User Studies and Design' at CHI 2011:

Pantidi, N., Rogers, Y., and Robinson, H.M. Considering two cases of non appropriation, CHI 2011 workshop on Appropriation and Creative Use: Linking User Studies and Design, Vancouver.

An overview of the work with some initial findings has been presented and awarded as 'Best Student Paper' in the Doctoral Consortium at ICALT 2010:

Pantidi, N. Appropriating Technology-rich Learning Spaces, Proc. IEEE 10th International Conference on Advanced Learning Technologies (ICALT 2010 Doctoral Consortium), 2010, p. 695-696.

An overview of the findings from Chapter 4 and 5 has been presented in the workshop 'Next Generation of HCI and Education' in CHI 2010:

Pantidi, N., Rogers, Y., and Robinson, H.M. Understanding Technology-rich Learning Spaces, Next Generation of HCI and Education Workshop, CHI 2010, Atlanta, GA, USA.

Part of the analysis and findings on Chapter 5 has been presented in INTERACT 2009 as a full paper:

Pantidi, N., Rogers, Y., and Robinson, H.M. (2009). Is The Writing on the Wall for Tabletops?, Proc. INTERACT 2009 (2), p. 125-137.

Part of Chapter 4 has been presented as a short conference paper in British HCI 2008:

Pantidi, N., Rogers, Y., and Robinson, H.M. (2008). Can technology-rich spaces support multiples uses?, In *Proceeding BCS-HCI '08 (22nd British HCI Group Annual Conference on People and Computers: Culture, Creativity, Interaction - Volume 2*, Liverpool, UK.

Table of Contents

CHAPTER 1 INTRODUCTION	1
1.1 BACKGROUND.....	2
1.1.1 DEFINING INNOVATIVE LEARNING SPACES.....	2
1.1.2 A VISION FOR THE FUTURE OF EDUCATION	4
1.1.3 CURRENT STUDIES OF INNOVATIVE LEARNING SPACES	5
1.1.4 INNOVATIVE LEARNING SPACES AND HCI.....	5
1.2 RESEARCH QUESTIONS	8
1.3 THESIS CONTRIBUTION	9
1.4 THESIS OUTLINE	10
CHAPTER 2 LITERATURE REVIEW	12
2.1 INTRODUCTION	13
2.2 INNOVATIVE LEARNING SPACES	15
2.2.1 MOTIVATION AND CHARACTERISTICS.....	15
2.2.2 VISIONS AND CHALLENGES.....	19
2.2.3 GUIDELINES, STUDIES AND FRAMEWORKS	20
2.2.4 SYNOPSIS	29
2.3 HCI AND INNOVATIVE LEARNING SPACES	31
2.3.1 SUPPORTING ACADEMIC COMMUNITIES	32
2.3.2 INTERACTING WITH DISPLAYS IN PUBLIC SPACES	34
2.3.3 SUPPORTING INFORMAL LEARNING IN MUSEUMS.....	37
2.3.4 SYNOPSIS	39
2.4 CHAPTER SYNOPSIS	41
CHAPTER 3 METHODOLOGY	44
3.1 INTRODUCTION	45
3.2 METHODOLOGICAL APPROACH AND ANALYTIC ORIENTATION	46
3.2.1 ETHNOGRAPHY.....	46
3.2.2 SITUATED ACTION	50
3.3 COLLECTING, ANALYSING AND ACCOUNTING	53
3.3.1 COLLECTING THE DATA.....	53
3.3.2 ANALYSING THE DATA	61
3.3.3 ACCOUNTING FOR THE FINDINGS	64
3.3.4 CHALLENGES IN COLLECTING, ANALYSING AND ACCOUNTING.....	65

3.3.5	THE RESEARCHER'S ROLE	66
3.3.6	ETHICAL CONSIDERATIONS	68
CHAPTER 4 DSPACE		73
4.1	INTRODUCTION	74
4.2	THE STUDY.....	75
4.2.1	CHOICE OF SETTING	75
4.2.2	DATA COLLECTION.....	75
4.2.3	DATA ANALYSIS.....	77
4.2.4	PARTICIPANTS	77
4.2.5	ETHICAL CONSIDERATIONS	78
4.3	THE SETTING.....	80
4.3.1	SETTING DESCRIPTION	80
4.3.2	ANTICIPATED USE.....	83
4.4	ACTUAL USE	87
4.4.1	A CONFUSING SPACE.....	87
4.4.2	A PRIVATE SPACE	89
4.4.3	MINIMAL USE OF FAMILIAR TECHNOLOGICAL DEVICES	93
4.5	DISCUSSION	99
4.5.1	ACTUAL VERSUS ANTICIPATED USE.....	99
4.5.2	APPROPRIATION AND FACILITATION	104
4.5.3	SUMMARY OF OUTCOMES	106
CHAPTER 5 QSPACE		108
5.1	INTRODUCTION	110
5.2	THE STUDY.....	112
5.2.1	CHOICE OF SETTING	112
5.2.2	DATA COLLECTION.....	112
5.2.3	DATA ANALYSIS.....	113
5.2.4	PARTICIPANTS	113
5.2.5	ETHICAL CONSIDERATIONS	114
5.3	THE SETTING.....	115
5.3.1	SETTING DESCRIPTION	115
5.3.2	ANTICIPATED USE	119
5.4	EVENT 1: WORKSHOP ON SHAREABLE INTERFACES FOR LEARNING	122
5.4.1	DESCRIPTION OF THE SETTING FOR THE WORKSHOP EVENT	122
5.4.2	ACTUAL USE.....	125
5.5	EVENT 2: THE SCRAPBOOK EVENT	139

5.5.1	DESCRIPTION OF THE SETTING FOR THE SCRAPBOOK EVENT	139
5.5.2	ACTUAL USE	141
5.6	DISCUSSION.....	148
5.6.1	ACTUAL VERSUS ANTICIPATED USE	148
5.6.2	AN UNCONVENTIONAL SPACE.....	151
5.6.3	FACILITATING AN UNCONVENTIONAL SPACE	154
5.6.4	FURTHER REFLECTIONS ON THE FACILITATION OF QSPACE.....	156
5.6.5	SUMMARY OF OUTCOMES	159
CHAPTER 6 CSPACE		161
6.1	INTRODUCTION	162
6.2	THE STUDY	163
6.2.1	CHOICE OF SETTING	163
6.2.2	DATA COLLECTION	164
6.2.3	DATA ANALYSIS	166
6.2.4	PARTICIPANTS	167
6.2.5	ETHICAL CONSIDERATIONS.....	167
6.3	THE SETTING	168
6.3.1	SETTING DESCRIPTION.....	168
6.3.2	ANTICIPATED USE.....	170
6.4	ACTUAL USE	173
6.4.1	ACTIVITIES ACROSS BOOTHS: COEXISTENCE OF DIVERSE ACTIVITIES.....	173
6.4.2	FROM WORKING TO SOCIALISING	175
6.4.3	TECHNOLOGY USE	183
6.4.4	PATTERNS OF COLLABORATION: TRANSCENDING BOOTH LIMITATIONS	190
6.5	DISCUSSION.....	194
6.5.1	ACTUAL VERSUS ANTICIPATED USE	194
6.5.2	SENSE OF COMMUNITY	198
6.5.3	SUMMARY OF OUTCOMES	200
CHAPTER 7 DISCUSSION		203
7.1	INTRODUCTION	204
7.2	TENSIONS ARISING FROM THE CHALLENGES OF A MULTI-PURPOSE AGENDA	206
7.3	A FRAMEWORK FOR SUPPORTING FLUID TRANSITIONS IN INNOVATIVE LEARNING SPACES	210
7.3.1	LEGIBILITY	211
7.3.2	LEGITIMACY AND SENSE OF OWNERSHIP.....	213
7.3.3	CUSTOMISATION AND APPROPRIATION	216
7.4	THREE PERSPECTIVES ON THE DESIGN AND USE OF INNOVATIVE LEARNING SPACES	221

7.5	BROADER SUGGESTIONS FOR THE DESIGN OF INNOVATIVE LEARNING SPACES	225
7.5.1	INVOLVING THE STAKEHOLDERS IN THE DESIGN	225
7.5.2	POST-OCCUPANCY STUDIES	227
7.5.3	APPROPRIATE FACILITATION	228
7.5.4	SIMPLE INFRASTRUCTURE (LESS IS MORE)	230
7.5.5	PRIORITISING THE EXPERIENCE OF ONE ACTIVITY	231
7.5.6	COMMUNITY OF USERS	232
7.6	CHAPTER SYNOPSIS.....	233
 CHAPTER 8 CONCLUSION AND FUTURE WORK.....		234
8.1	CONCLUSION	235
8.2	LIMITATIONS	240
8.3	FUTURE WORK.....	241
 REFERENCES.....		244
 APPENDICES.....		254

Table of figures

FIGURE 1.1 ON THE TOP LEFT, THE LEARNING LAB AT THE UNIVERSITY OF MELBOURNE’S SCHOOL OF CHEMISTRY; ON THE TOP RIGHT, THE TEACHING GRID IN THE UNIVERSITY OF WARWICK, UK; AND ON THE BOTTOM, THE INFOCOMMONS SPACE IN NORTHWESTERN UNIVERSITY, USA	3
FIGURE 2.1 (1). THE DOCKLAMP, (2) THE REFLECT TABLE; (3) A SKETCH OF HOW SYNERGYNET IS ENVISIONED FOR THE WHOLE CLASSROOM; AND (4) A PHOTO OF IT IMPLEMENTED IN A LAB SETUP OF THE CLASSROOM.....	18
FIGURE 2.2 PEDAGOGY SPACE TECHNOLOGY FRAMEWORK BY RADCLIFFE ET AL.(2009)	25
FIGURE 3.1. AN EXAMPLE OF THE SOCIOGRAM USED IN THE STUDY: IT SHOWS MALE PARTICIPANT A1 ENTERING DSPACE, MOVING TOWARDS THE SHELF WHERE THE GAME CONSOLES ARE, WHERE HE SPENT 4 MINUTES, THEN HEADED TO THE COFFEE MACHINE, GOT A COFFEE AND THEN SAT ON THE COUCH FOR 15 MINUTES TO DRINK HIS COFFEE. “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, “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	58
FIGURE 3.2 INTERVIEW SCRIPT FOR THE MANAGER OF DSPACE	59
FIGURE 3.3. EXAMPLES OF THE CONCEPT MAPS SKETCHED FOR THE ANALYSIS.....	62
FIGURE 4.1. TWO VIEWS OF DSPACE, SHOWING THE PLACEMENT OF TECHNOLOGY AND FURNITURE AGAINST THE WALLS AND THE SMALL PORTHOLE WINDOWS THAT PROVIDED THE ONLY VIEW INTO DSPACE.....	81
FIGURE 4.2. ON THE LEFT AND MIDDLE, SMARTPHONES, GAMES, HANDHELD GAME CONSOLES AND BOOKS DISPLAYED ON THE SHELVES IN DSPACE; AND ON THE RIGHT THE TOUCH SCREEN THAT CONTROLLED THE LCD SCREEN AND PROJECTOR SCREEN AS WELL AS INPUT SOURCES TO THOSE (LAPTOP, GAME CONSOLES ETC).....	82
FIGURE 4.3. AFFORDANCES AND RESOURCES PROVIDED WITH TECHNOLOGY: (1) PRINTOUTS THAT INDICATED THE ZONES IN THE ROOM; (2) MANUALS AND PRINTOUTS WITH INSTRUCTIONS NEXT TO THE GAME CONSOLES AND; (3) INSTRUCTIONS POSTED ON THE WALL.....	83
FIGURE 4.4. ‘CREATING CORNERS’ IN DSPACE	92
FIGURE 4.5. ON THE LEFT PICTURE, THE CONTROL PANEL FOR THE PROJECTOR AND ON THE RIGHT, IT IS SHOWN THE POSITION OF THE PANEL WITHIN DSPACE; THE WHITE ARROW POINTS AT THE CONTROL PANEL AND THE BLACK SHOWS WHERE THE PROJECTOR SCREEN IS	97
FIGURE 5.1. A 3D PLAN OF QSPACE SHOWING ITS RECONFIGURABLE PARTS; MOVABLE WALLS ARE DEPICTED IN PURPLE AND BROWN.....	115
FIGURE 5.2. DIFFERENT CONFIGURATIONS OF QSPACE’S MAIN AREA FOR DIFFERENT EVENTS HOSTED	117
FIGURE 5.3. DIFFERENT CONFIGURATIONS OF QSPACE USED DURING THE ACADEMIC WORKSHOP DEPENDING ON THE ACTIVITY THAT TOOK PLACE: (1) KEYNOTE SESSION CONFIGURATION; (2) (3) (4) AND (5) QSPACE SEPARATED IN FOUR SMALLER AREAS TO ACCOMMODATE FOR THE FOUR BREAKOUT SESSIONS ON THE FIRST DAY; (6) DEMO AND POSTER SESSION CONFIGURATION; (7) AND (8) QSPACE SPLIT IN TWO AREAS TO HOST TWO OF THE THREE GROUPS FOR THE DESIGN BREAKOUT SESSIONS ON THE SECOND DAY.	124
FIGURE 5.4. BREAKOUT GROUP IN MORE CONVENTIONAL MEETING ROOM USING PLASMA SCREEN FOR SHOWING SLIDES AS CREATED TO OTHERS IN THE GROUP	128
FIGURE 5.5. DIFFERENT SEATING POSTURES ON CHAIRS AND BEAN BAGS.....	131

FIGURE 5.6. (1) PARTICIPANTS DRAWING ON THE WALL AS PART OF THE GUIDED IMAGERY EXERCISE; (2) BRAINSTORMING; (3) SUGGESTED DESIGN SOLUTIONS ON THE WALL, AND (4) PARTICIPANTS LYING ON THE FLOOR AND BEAN BAGS TO WORK ON THEIR DRAWINGS..	134
FIGURE 5.7. USE OF SURFACES TO CREATE MAKE-SHIFT TABLES (1) AND (2) TALL CARDBOARD BOXES; (3) PARTS OF PHYSICAL WALLS; (4) AND (5) STOOLS AND CARDBOARD BOXES	136
FIGURE 5.8. GROUP DOING LOW-TECH PROTOTYPING ON CARDBOARD BOXES	136
FIGURE 5.9. (1) AND (2) STOOLS WERE APPROPRIATED AS INDIVIDUAL TABLES FOR PLACING PERSONAL OBJECTS OR WORKING ON THEM; (3) AND (4) CHAIRS BEING USED AS AUXILIARY STORING AREAS	137
FIGURE 5.10. SEMI-PRIVATE ZONES, CREATED BY PARTICIPANT'S POSTURE AND THEIR POSITIONING TOWARDS THE SCREEN OR STANDS.....	138
FIGURE 5.11. TWO OF THE THREE AREAS THAT WERE SET UP FOR THE SCRAPBOOK EVENT: (1) AND (2) MAIN EXHIBITION AREA AND (3) WORKSHOP AREA.....	140
FIGURE 5.12. (1) ADVERTISING BANNER OF THE SCRAPBOOK EVENT; (2) STALL OWNER ADVERTISING HIS CAUSE WITH A MINI-PERFORMANCE	140
FIGURE 5.13. AWKWARD INTERACTIONS WITH PLASMA SCREEN: (1) THE PARTICIPANT HAS TO TURN HIS HEAD TOWARDS THE BACK IN ORDER TO SEE THE CONTENT IN THE SCREEN; AND (2) THE PARTICIPANT HAS TO SIT TO USE THE KEYBOARD AND MOUSE.....	142
FIGURE 5.14. NEW INFORMATION BEING ADDED TO THE WALLS AND BANNERS DURING THE SCRAPBOOK EVENT.....	143
FIGURE 5.15. WRITING AND ADHERED PRINTED MATERIALS ON A QSPACE WALL	144
FIGURE 5.16. EXAMPLES OF WRITINGS ON THE WALL ILLUSTRATING DIFFERENT PERSONAL STYLES.....	145
FIGURE 5.17. USE OF SURFACES TO CREATE MAKE-SHIFT TABLES (1) AND (2) STOOLS AND CARDBOARD BOXES; (3) AND (4) CHAIRS BEING USED AS AUXILIARY STORING AREAS.....	146
FIGURE 5.18. SEMI-PRIVATE ZONES, CREATED BY PARTICIPANT'S POSTURE AND THEIR POSITIONING TOWARDS THE SCREEN OR STANDS IN SCRAPBOOK	147
FIGURE 5.19. IN CONTRAST TO QSPACE, WHILE IN THE CONVENTIONAL MEETING ROOM, THE WORKSHOP PARTICIPANTS WERE SEEN USING ALL THE AVAILABLE INFRASTRUCTURE (PROJECTOR, PLASMA SCREEN) IN COMBINATION WITH THEIR PERSONAL DEVICES.	154
FIGURE 6.1 PRINTED A4 PAPERS POSTED ON THE BOTTOM OF THE STAIRCASE OF EACH FLOOR OF THE BUILDING TO INDICATE THE LOCATION OF CSPACE.....	168
FIGURE 6.2. THE TUTOR'S PODIUM AT THE FRONT OF CSPACE.....	169
FIGURE 6.3. (1) A TYPICAL AMERICAN DINER CONTRASTED WITH THE DESIGN OF CSPACE (2) WITH HIGH TABLES AND STOOLS AND BOOTHS WITH TABLES AND FACING COUCH SEATING TO ALLOW FOR PROLONGED USE; (3) AND (4) SHOW FRIENDS SEATED AND SHARING IN DINER BOOTHS	172
FIGURE 6.4. PHOTOS OF THE VARIETY OF ACTIVITIES THAT CO-EXISTED IN CSPACE: (1) WORKING IN PAIRS ON A GROUP ASSIGNMENT, (2) INDIVIDUAL STUDY, (3) PRACTICAL SOFTWARE ENGINEERING SESSIONS WITH THE TUTORS PRESENT, AND (4) RELAXING	174
FIGURE 6.5. STUDENTS (1) USING THEIR OWN LAPTOPS AND (2) PLUGGING THEM INTO THE SMARTBOARD IN THE BOOTH	185
FIGURE 6.6. A DEMONSTRATION OF THE INTERACTIVE FEATURES OF A SMARTBOARD	188
FIGURE 6.7. PATTERNS OF COLLABORATION: (1),(2) STUDENTS WORKING IN PAIRS SIDE BY SIDE SHARING ONE SCREEN OR ALTERNATING BETWEEN MONITORS AND NOTES; (3),(4),(5) STUDENTS WORKING IN PAIRS ACROSS THE BOOTH AND EITHER USING THE SMARTBOARD OR TURNING THEIR MONITORS; AND (6) WHOLE GROUP COLLABORATION WHILE SHARING INFORMATION ON THE SMARTBOARD.....	191
FIGURE 6.8. SIGNS IN DIFFERENT STUDY SPACES AND LABS FORBIDDING DRINKING, EATING AND THE USE OF MOBILE PHONES.....	196

List of Appendices

APPENDIX 1: DSPACE SOCIOGRAMS

APPENDIX 2: RECORDS OF EMAIL EXCHANGE FOR THE WORKSHOP EVENT

APPENDIX 3: DSPACE/CSPACE INFORMATION SHEET

APPENDIX 4: CSPACE QUESTIONNAIRES

APPENDIX 5: INTERVIEW SCRIPTS

Dedication

To my most influential mentor, my Dad, whom I missed greatly in this journey.

PART I
MOTIVATION

Chapter 1

Introduction

Contents

1.1	Background	2
1.1.1	Defining innovative learning spaces	2
1.1.2	A vision for the future of education	4
1.1.3	Current studies of innovative learning spaces	5
1.1.4	Innovative learning spaces and HCI	5
1.2	Research questions	8
1.3	Thesis Contribution	9
1.4	Chapter Outline	10

1.1 Background

In September 2010, a new library building was inaugurated in a university in Los Angeles. The new library was different from most conventional libraries; insofar as it included a café-restaurant area, a lounge with television monitors, a fireplace and comfortable armchairs - but no books. All the book collections were placed two floors underground; they could be ordered online and collected at any time. This university library is one among many spaces undergoing similar changes in Higher Education (HE).

1.1.1 Defining innovative learning spaces

In the last 10 years, universities and colleges have invested in creating and designing what has been coined as *innovative learning spaces*. The creation of these spaces represents a shift away from a tutor-centered towards a student-centered model of learning. The multi-purpose agendas of innovative learning spaces envision a combination of:

- A variety of learning activities (formal and informal) taking place seamlessly,
- Collaboration among users and
- Socialising

Innovative learning spaces aim to accommodate for the above by incorporating the following characteristics: a variety of networked technological devices and comfortable and flexible furniture in newly furnished or refurbished rooms and buildings. While the design of innovative learning spaces aims to support formal and informal learning activities, collaboration, and socializing *seamlessly, within*

the same space and often *at the same time*, how their designs are realised varies.

Some examples can be seen in Figure 1.

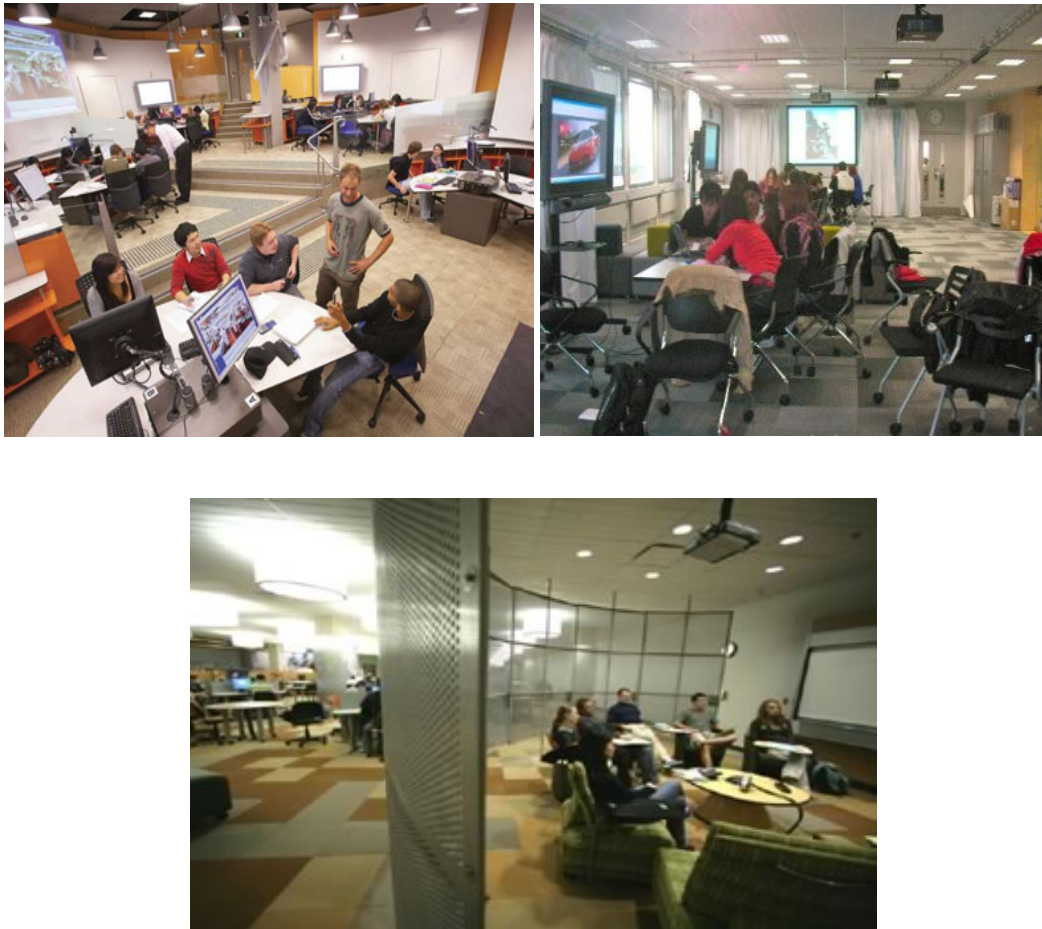


Figure 1.1 On the top left, the Learning Lab at the University of Melbourne's School of Chemistry; on the top right, the Teaching Grid in the University of Warwick, UK; and on the bottom, the InfoCommons Space in Northwestern University, USA

In the UK, one of the first universities that embraced this agenda – even though at the time it was confronted with a lot of scepticism – was Glasgow Caledonian University. In 2001, the Learning Café was built, an area that combined refreshments, social activities, learning and technology. The Learning Café – that demonstrated the concept of innovative learning spaces – was described as a huge success by the university administration (Watson, 2007; Watson, 2007a). Since then, innovative learning spaces began appearing more widely in the UK following this initial success. In 2007-8, a total of 74 new spaces had been built, funded through the Centres for Excellence in Teaching and Learning (CETL) initiative

(HEFCE, 2008) and many others funded by other means (e.g. Scottish Funding Council).

1.1.2 A vision for the future of education

The creation of such spaces has been talked about as long overdue and necessary in keeping with the technological advances and as an investment for future education. For example, in an article in the Times Higher Education, Davidson (2011) commented on how US Higher Education is still driven by the industrialisation model – now 150 years old: *“My students live an extracurricular digital life that is as rich, varied and ever-changing as is the world of work that lies ahead of them. Sadly, in between their digital personal lives and the digital work life ahead stands the institution of education as stern and unyielding as Taylor with his stopwatch (...)”*. There has been much written about the visions, aspirations and expected benefits of such spaces. Several authors and researchers describe the phenomenon as a *“revolution”* for education (Davidson, 2011), discuss the challenges involved, and share their enthusiasm as to what these learning spaces of the future can bring.

The impact of such innovative spaces on learning, however, is open to question. Recently, in the UK Guardian newspaper, Baker (2011) argued that higher education needs to stay in tune and continue adopting current information and communication technologies, despite the current funding cuts. He continued by arguing that the benefit of innovative learning spaces is that they attract prospective students, enhance their experiences and prepare them for their future jobs. In contrast, Day (Shepherd, 2007) questions whether having such spaces can be beneficial for the students: *“I am not convinced that students will learn any more about what's expected of them academically in such an environment”*.

Similarly, the Secretary of Education in the UK just enforced a policy of “*simplified architectural design*” for educational buildings - as opposed to “*a decade of wasteful extravagance*” - which has supporters of these spaces (educators and architects) up in arms (Booth, 2012).

1.1.3 Current studies of innovative learning spaces

So far there have been a number of studies that look into managerial and ergonomic aspects of these spaces (e.g. light, ventilation, colour) with respect to metrics of learning performance (e.g. grades, TA levels). These consist of surveys, performance tests, interviews, focus groups and literature-based research approaches, commissioned, mostly, by funding bodies in an attempt to evaluate existing spaces and establish guidelines for the design of future ones. What these studies were not able to capture is what this thesis aims to address: a deeper understanding of the everyday lived experience as this unfolds through the minute-by-minute interactions of people with each other and with the architectural and technological infrastructure. Taking an ethnographic approach can provide detailed descriptions of what *actually* takes place in these spaces, how interactions are realised, and offer insights as to how multi-purposeness is achieved and how expected and actual use are balanced – if they are.

1.1.4 Innovative learning spaces and HCI

Understanding how technology is used in situ has been the main focus of investigations for a significant body of research in HCI. From approaches that look into the social order and organisation of everyday life (Crabtree et al., 2000; Crabtree et al., 2011; Luff et al., 2000; Luff and Heath, 2001) to more recent in the wild ones that take prototyping and usability studies out of the lab and into the real world (Marshall et al., 2011; Rogers, 2012; van der Linden et al., 2011), a big part

of HCI shares an analytical and methodological commitment that is oriented towards understanding interactions within their current context. Further, the areas of application are numerous. There have been studies that look into technologies for the home (Bly et al., 2006; Crabtree and Rodden, 2004; Grinter et al., 2009; Tolmie et al. 2010), workplaces and other organisational settings (Heath and Luff 1992; Heath, 2006; Luff and Heath, 2001; Luff et al., 2000; Suchman 2007), public spaces (Fischer and Hornecker, 2012; Marshall et al. 2011; O'Hara, 2008; Peltonen, 2008) museums and interactive performances (Hornecker, 2008, Flintham et al., 2011; Reeves et al. 2005) and of course learning (Horn, et al., 2012; Rogers et al, 2007; Adams et al, 2011). A number of technologies have been developed and evaluated to support the broad range of learning activities: from online teaching and virtual learning environments (such as Minocha and Reeves, 2010) to more open-ended, informal learning activities such as visiting museums (Horn et al., 2012; Clarke and Hornecker, 2013; Hinrichs and Carpendale, 2011) and outdoors geo-caching (Adams, et al., 2011; Jones et al., 2013). Yet so far, research in HCI has not had the chance to look into various off-the shelf technological devices being integrated in one single space with the purpose of supporting a range of learning activities, collaboration and socialising and into how users appropriate them. Innovative learning spaces provide this opportunity.

The focus of the work in this thesis takes on a similar in situ approach to explore how such spaces are experienced and used by the people they were designed for. One particular challenge lies on their multi-purpose agenda. Their overarching goal is to support technologically diverse expressions and learning activities simultaneously. At the same time, each of them was designed to address particular purposes that are important within the educational context of their institution; for instance, one of the settings studied in this thesis was developed to

support collaboration between students while another one to support creativity in learning.

1.2 Research questions

The innovative nature of the spaces described above lies at the interface of learning activities, flexible architecture and technological infrastructure. Managers have the role to facilitate while users are expected, envisioned or assumed to socialize, collaborate and engage in formal and informal learning activities while in these spaces.

This thesis investigates three innovative learning spaces through an ethnographic approach that, following the analytic orientation of Lucy Suchman's situated action (2007), considers the situated interactions and juxtaposes anticipated versus actual use. We base our investigations in these spaces on activities that involve people interacting with each other and with the architectural and technological infrastructure within the spaces. More specifically this work addresses the following research questions:

- How do people interact with the architectural and technological infrastructure and each other in innovative learning spaces on an everyday basis?
- How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?
- How do we account for the differences between actual and anticipated use of the spaces?
- How can spaces be designed or recover from breakdowns so that actual and anticipated use (re) align?

By addressing those questions, the present work contributes to an empirically-grounded understanding of how innovative learning spaces are being used and appropriated on an everyday basis, which has implications for the (re)design of current and future innovative learning spaces.

1.3 Thesis contribution

This thesis has the following key contributions:

1. The detailed descriptions of the written ethnographies in chapters 4-6 are the first known sustained academic investigations into describing and explaining the everyday use and interactions in innovative learning spaces.
2. The analyses in chapters 4-6 reveal tensions between actual and anticipated use, the situated nature of adaptable design, as well as the complex and contested processes through which interactions in innovative learning spaces are accomplished, adapted or superseded.
3. The framework presented in chapter 7 accounts for these differences between actual and anticipated use and proposes three factors for mediating fluid transitions in innovative learning spaces: legibility (infrastructural and social), legitimacy and sense of ownership and customization and appropriation. The aim of this framework is to sensitise and inform the design of innovative learning spaces.

In addition a set of broader suggestions for design have been developed through reflecting on the different perspectives for the use and design of innovative learning spaces. These can be found in Chapter 7.

1.4 Thesis Outline

The thesis comprises 8 chapters. Chapter 1 frames the research problem and states the contribution of this work.

Chapter 2 begins with a review of the literature of innovative learning spaces with regard to their characteristics, existing studies, guidelines and frameworks for their design and assessment. In section 2.3, we consider the relation between HCI and innovative learning spaces and present HCI studies conducted in-the-wild to showcase the particular relevance of this approach to providing insights for the understanding of innovative learning spaces.

Chapter 3 presents the methodological approach and the analytic orientation of this work with respect to the research questions and the literature review. A description of how data were collected, analysed and written for the purposes of this work follows along with a discussion of the challenges involved, the role of the researcher and other ethical considerations.

Chapters 4, 5 and 6 present the ethnographic studies, the analysis of the collected data and a discussion of these. Chapter 4 reports on the first study, Dspace, was an innovative learning space in a library building designed to be a space where people would come to explore new ideas and knowledge regarding teaching and learning in an informal playful manner; try out new technologies; and serendipitously meet others with common interests and consider new collaborations. Chapter 5 presents the second study, Qspace. Qspace was designed with a particular focus to support creativity in teaching and learning; its spatial layout was unconventional with elaborate technological infrastructure embedded in the physical layout. Chapter 6 presents the fieldwork for the third study, Cspace. Cspace was an innovative learning space designed to support collaborative work

between students as well as various other activities (individual study, practical sessions, programming etc).

Chapter 7 begins with a summarised review of the differences between actual and anticipated use of the three settings and proposes a framework that accounts for these differences. Three factors (legibility, legitimacy and sense of ownership and customization and appropriation) aim to sensitise and inform the design of innovative learning spaces. A reflection on the different perspectives regarding the use and design of innovative learning spaces is presented along with a set of broader suggestions for the design of innovative learning spaces.

Chapter 8 presents the concluding remarks, reports on the limitations of this work and plans for future work.

Chapter 2

LITERATURE REVIEW

Contents

2.1	Introduction	13
2.2	Innovative learning Spaces	15
2.2.1	Motivations and Characteristics	15
2.2.2	Visions and Challenges	19
2.2.3	Guidelines, studies and frameworks	20
2.2.4	Synopsis	29
2.3	HCI and Innovative learning spaces	31
2.3.1	Supporting academic communities	32
2.3.2	Interacting with displays in public spaces	34
2.3.3	Supporting informal learning in museums	37
2.3.4	Synopsis	39
2.4	Chapter Synopsis	41

2.1 Introduction

Innovative learning spaces are higher education¹ spaces that have been designed to support a variety of formal and informal activities, collaboration and socialising by means of technological infrastructure and flexible architectural design. Over the last decade, there has been a growing body of discussion examples of such spaces (JISC, 2009; Oblinger, 2006,) yet there is still no consensus about their impact or what should drive their design (Davidson, 2011; Shepherd, 2007; Temple, 2008, Radcliffe, 2009). So far various approaches have been taken including quantitative and qualitative methods with a primary focus on surveys, interviews and desk-based approaches. What seems to be lacking though is qualitative research that focuses on how such spaces are being used at an everyday level. We address this problem by taking an approach common in HCI, that of studies in the wild and carry out ethnographic observational studies on three innovative learning spaces aiming to understand what takes places in these spaces at an everyday context and how does that compare to their design and anticipated use. With this research we aim to contribute to current knowledge and research in the field of innovative learning spaces as well as that of HCI.

Innovative learning spaces pose an interesting challenge for the world of HCI. They offer a unique opportunity for a number of technologies to be developed, used and evaluated within the broader context of learning activities. To some extent, innovative learning spaces represent Mark Weiser's vision (1991) of ubiquitous computing but for learning. They are equipped with a technological infrastructure that aims to seamlessly support a variety of activities and allows for "*learning to take place everywhere in campus*" (Oblinger, 2006). Already there are a

¹ For this thesis we focus on higher education ones but in practice they exist in all levels of education (primary, secondary and higher education)

number of technologies being developed to address the challenges of ubiquitous learning but these are not yet part of the innovative learning spaces and further need to be trialled and considered in situ. Hence, it is within the interest of HCI to support the design process of such spaces and gain more insights as to the kinds of technologies that are relevant to their users.

In this chapter, we review visions and challenges of innovative learning spaces, existing studies, guidelines and frameworks for their design and assessment. In section 2.3, we consider the relation between HCI and innovative learning spaces and present HCI studies conducted in-the-wild to showcase the particular relevance of this approach to providing insights for the understanding of innovative learning spaces.

2.2 Innovative learning spaces

2.2.1 Motivation and Characteristics

Innovative learning spaces are higher education spaces that have been designed to support a variety of learning activities, by means of technological infrastructure and flexible architectural design. The creation of innovative learning spaces has been motivated by a shift away from traditional approaches of learning – where learning is seen as knowledge that can be delivered only by the tutor in the auditorium – and towards student-centred approaches that emphasise on learning taking place anywhere and anytime, students being active participants in their learning, socialising, peer communication and collaboration. As Oblinger describes in the e-book *Learning Spaces* (2006): “*The key, therefore, is to provide a physical space that supports multidisciplinary, team-taught, highly interactive learning unbound by traditional time constraints within a social setting that engages students and faculty and enables rich learning experiences.*”

To support this range of formal and informal activities taking place, innovative learning spaces were designed with an emphasis on *flexible, comfortable architectural design* (variety of furniture including armchairs and couches and portable, adaptable artefacts such as chairs, tables on wheels and partitions) and *technological infrastructure* (wifi, interactive whiteboards, laptops, desktops etc).

Architectural layout and furniture

In terms of the architecture, a main concern voiced in the literature is overcoming the traditional design that has been prevailing since the 19th century (McGregor, 2004; Schratzenstaller, 2010; Long and Holeton, 2009; Van Note Chism, 2006). Long and Holeton (2009) refer to an “*industrial model of education*” as the elephant in the room and contrast that with the needs of the 21st century learner. Van Note

Chism (2002; 2006) further notes how the standards in for most universities are directed towards “*old paradigm ways of thinking*”.

What is meant by those, and traditional architectural design in general, is the uniformity design where all spaces in a campus look the same and the tutor/teacher-based design where the whole learning experience is oriented towards passively attending to whoever is lecturing (auditoriums and lecture theatres). Attention to the architectural design of educational buildings has become an important concern and overcoming such design principles is a main feature for the design of innovative learning spaces. To address this, a flexible layout that can support a variety of learning activities has been proposed (Oblinger, 2006; Fischer, 2005; Strange and Banning, 2001). A variety of comfortable furnishing in combination with an architectural layout that can be transformed are suggested as one way of enabling the new pedagogical approach that embraces informal collaborative learning, creativity and socializing. Flexibility is presented as the desired state for innovative learning spaces and some more specific spatial arrangements are suggested occasionally in the literature by means of case studies (Oblinger, 2006; Dudek, 2000; JELS, 2009) yet such relations are described in a rather simplistic manner: as if they would work for everyone.

This is recognised by several authors (Jamieson, 2008; Boys, 2011; Radcliffe, 2009), for the most part architects that comment on the vagueness and naivety that flexibility is often mentioned by in the context of innovative learning spaces. As Jamieson puts it (2008: 58):

“What is meant by flexibility? Does it refer to the capacity to move and re-arrange furniture at the discretion of the user, allowing the use to change according to need? Does it refer to the range of activity that can be supported in a single space simultaneously?”

Boys (2011) equally stresses how often a number of metaphors (such as street, hubs, learning cafes) and taken-for-granted notions are used to describe or imply architectural features with relation to learning activities; yet what is unclear is whether these metaphors are understood and shared across the different stakeholders. To better understand these and most importantly the complex interrelationships between features of architectural design and use (and afterwards learning) different approaches are necessary. Potentially approaches that examine the lived everyday experience of users of such spaces and can account for subtle situated differences are more appropriate; and as Boys (2011) and Temple (2009; 2008) note more qualitative work in the space of innovative learning spaces is needed.

Technological infrastructure

Together with the architectural design, technological infrastructure is a main feature of innovative learning space. The emphasis is for a technological infrastructure that will support existing mechanisms of learning that take place anywhere, anytime (ubiquitous learning).

A number of technologies are already being developed that aim and/or aspire to assist the vision and practice of innovative learning spaces more appropriately than the existing ones. For example, Kaplan et al. (2009) propose using technology to enhance active and collaborative learning, through providing students with various kinds of *interpersonal computers*, that is technologies where several people can interact with at the same time, in the same place. Such technologies should enable “*fluid but lively exchanges including, in particular argumentation episodes*”, and are “*sufficiently discreet to not act as obstacles during natural interactions but engaging enough to enrich people’s awareness and*

possibility of actions”. They have developed novel prototypes (see (1) and (2) in Figure 2.1), including the DOCKLAMP, a portable smart lamp that augments people’s interactions on tables by projecting images and documents (Kaplan et.al 2007; Kaplan and Dillenbourg, 2010) and the REFLECT table that shows who is talking the most in group meetings, by representing how much each participant is speaking as a line of LEDs in front of them on the table (Bachour, 2008). Another example of such technologies is developed by the SynergyNet Project (see Figure 2.1) and involves an ecology of interactive multi-touch surfaces to support a variety of learning activities e.g. tabletops could support collaboration and the vertical displays awareness and reflection for the whole classroom (AlAgha et al., 2010).



Figure 2.1 (1). the DOCKLAMP, (2) the REFLECT table; (3) a sketch of how SynergyNet is envisioned for the whole classroom; and (4) a photo of it implemented in a lab setup of the classroom

However, until now these technologies have only been tested in lab settings and not in the real world so their shown benefits remain limited in this

respect.

Currently, innovative learning spaces consist of commercial, off-the-shelf technologies (laptops, desktops, interactive whiteboards) and students are reportedly using such technologies rarely (Margaryan et al., 2011). It is unclear whether this will change with more customized technologies as the ones mentioned earlier. Both with new kinds of technologies as the ones just described and with more commonplace ones such as the ones currently existing in innovative learning spaces (e.g. laptops and desktops), a main challenge seems to be where and when should technology be used and in what form. A number of studies and frameworks, reviewed later in this chapter, attempt to address this challenge mainly by having the learning goals lead the technological design. Looking into what people currently do with the technology in these spaces can be another useful starting point.

2.2.2 Visions and challenges

Many authors (such as Watson, 2007; Davidson, 2011; McGregor, 2004; Oblinger, 2006; Schratzenstaller, 2010) expect significant benefits from such learning spaces as they see them fit to address more adequately the pedagogical needs of our time, providing students with the necessary tools for personal growth and professional competitiveness. Davidson (2011) describes the need of such spaces as the next “*revolution for education*” and shares her enthusiasm as to what these learning spaces of the future can bring.

Apart from the benefits, a number of challenges are also identified. Those span across various levels, from funding, building and maintenance concerns and to issues of community and adoption of the new ways of learning. For example, Kollar (2010) identifies three broader challenges for such spaces. The first challenge

concerns the learning goals that the new approaches are addressing and whether they can achieve them in a more efficient way than the existing practices. The second challenge is whether the impacts observed in learning can be attributed to a technological innovation or it is caused by a change in the learning approach. The third challenge is about barriers that need to be overcome at political, research and practitioner level.

What such challenges come to show is that innovative learning spaces are places of interest – or should be – among various stakeholders such as policy makers, educators, technologists and researchers. Their agenda is to some extent linked with socio-economic realities as well as educational developments and agendas and the same for technological advances. As a result, the design of innovative learning spaces and their benefits need to be considered within this multidisciplinary context.

2.2.3 Guidelines, Studies and Frameworks

In terms of what consists a good example of an innovative learning space or articulating the criteria or concepts towards successful innovative learning spaces, several studies have been carried out, guidelines provided and frameworks developed (JISC, 2009; Jamieson, 2005; Oblinger, 2006; Temple, 2007; Siddall, 2006, JELS, 2009; Pearhouse et al., 2009, Radcliffe, 2009). The evaluation of innovative learning spaces is necessary not only to provide evidence of the return of the investment – e.g. the cost of the CETL initiative in the UK was 315 million pounds – but mostly, because assessing those spaces will provide a better understanding of the benefits, the learning needs, the values (individual, institutional), the impact of the technological and architectural infrastructure and feed back to future planning and design. Many authors that have been assigned

with reporting or evaluating on the design and use of innovative learning spaces have carried out surveys, literature reviews, phone based interviews with stakeholders or short visits to the settings and proposed a number of guidelines.

Guidelines

In addition to the lack of consensus as to how such spaces are meant to be designed, that was mentioned earlier, the guidelines that are produced are for the most part vague or aspirational. Further, when those guidelines are presented, the empirical evidence based on which they were produced are not evident or easy to track. Most of the times, tracking the specifics of the methodology undertaken is a difficult task too. Some examples that show the vagueness of such guidelines follow.

Oblinger (2006) focuses on taking a learner centered approach as to the design of such spaces:

- Design spaces around people
- Support multiple types of learning activities
- Design for comfort, safety and functionality
- Reflect institutional values
- Accommodate information technology

Siddal et al. (2006) present the following guidelines:

- Learning spaces should support a diversity of learning styles
- Learning spaces must be versatile
- Learning spaces must be comfortable and attractive

- Learning spaces are information rich and technologically reliable
- Learning spaces should be used effectively

There are more examples of similar guidelines but it is believed that the above make the point regarding the existing vagueness. What is important to note is that such lists are difficult to apply in practice as they are rather formalistic. A step closer towards informing design in a practical way is offered by a few frameworks that have been developed.

Studies and Frameworks

As presented earlier one of the prevailing challenges and concerns when it comes to innovative learning spaces has been establishing a consensus as to their assessment and design principles. A further challenge relates to the kinds of studies undertaken. A report from the Scottish Funding Council (2006) on spaces for learning suggests that despite the plethora of reviews of learning, very few empirical studies link that body of research to the actual environment where learning takes place. In the same report, it is argued that the relationship between the environment and learning is not a straightforward one and hence a more complex form of assessment is needed. Similarly, a review of the literature on Learning Spaces for the 21st Century commissioned by the Higher Education Academy (Temple, 2007) found that the role space plays in supporting academic pedagogical practices is not well understood, and that a methodological study on evaluation – including financial or other costs and learning benefits – should be conducted. Likewise, Fischer (2005) argues that there is “*insufficient qualitative/deep research*” in the learning spaces’ literature and stresses the need to involve teachers in the research/evaluating process to assist in understanding how the design can or does relate to the pedagogical practices.

More recently, systematic reviews on the existing tools and methodologies have produced frameworks to guide future evaluation. For example, the JISC 'Study of Effective Evaluation Models and Practices for Technology Supported Physical Learning Spaces' project (JELS project, Pearshouse et al., 2009) aimed to identify and review the existing tools and method used to evaluate innovative learning spaces. They carried out desk-based research, stakeholders workshops, telephone interviews and a web based survey to collect their data. The final report identified a need for higher education sector to reconsider the evaluation of such spaces and clarify design intentions and learning needs and proposed a typology to help with the categorization of such evaluations namely the Framework for Evaluating Learning Spaces (FELS). The typology suggested by Pearhouse et al. (2009) is based on the values of the reviewers/evaluators of such places and offers insights into their assumptions. Based on this, they identify seven models that each reflects a different lens that the evaluation takes. These are:

- the Demand model where evaluation is based on space metrics and finances,
- the Outcomes model focuses on learning outcomes,
- the Satisfaction model focuses on data about the self-reported experiences of users,
- the Scenario Provision model (scenarios are made that hypothesize on the use of innovative learning spaces before they are built),
- the Activity Support model focuses on evaluating activities in practice – often using observations,
- the Spatial Ecology model focuses on the relations between various

spaces in one building and

- the Brand model focuses on the institutional image and relating metrics.

The above typology is a reflection and a useful tool on categorising the existing evaluation work and metrics on the design of innovative learning spaces and shows the wide range of approaches that exist as well as the ambiguity that might emerge in terms of the results of such evaluations if the lens is not clearly stated. Apart from providing this typology, the authors further stress their view that more studies of observational nature are needed as currently there are very few (one mentioned –see next section) that exist.

Another framework is that of Radcliffe et al. (2009) known as the Pedagogy-Space-Technology. This framework identifies three areas (Pedagogy, Space and Technology) that influence each other and provides a set of questions for each of the three areas that aim to help stakeholders conceptualise the design of such spaces in shared ways. Radcliffe et al. point out how the framework was intentionally kept simple and the questions open ended across the three categories for all stakeholders as their idea for it is to allow for the different perspectives to be revealed and brought together through the line of questioning.

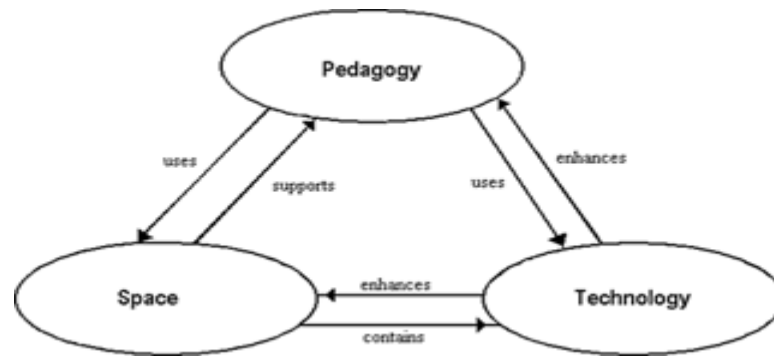


Figure 2.2 Pedagogy Space Technology Framework by Radcliffe et al.(2009)

Finally another framework is that of Social Infrastructure (SIF) (Bielaczyc, 2006). Bielaczyc’s framework has a distinct emphasis on the processes of learning that underlie and inform the design of the learning spaces and even more the design of technological applications. Four dimensions are suggested that need to be considered for the success of socio-technological innovations: i) cultural beliefs; ii) specific practices, iii) socio-techno-spatial relations, and iv) interaction with the “outside world.” All these are driven by learning and the specific curricula of each learning space and it is mostly up to the educator (teacher or tutor) to assess them and inform the design.

Initiatives and post occupancy studies

In addition to the studies, a number of initiatives on the design of innovative learning spaces have emerged. Some of them are technology-driven and some of them are pedagogically driven and some focus on the architecture and the built environment. In all cases there is a common census that all three are intertwined and significant. The difference lies on what is considered the force that will drive design.

These initiatives also seek to bring together the stakeholders involved in the design of innovative learning spaces (as mentioned above involving the

stakeholders in important). For instance, the Learning Landscapes Project (2010) explores the effect the built environment of university campuses has on the dynamic between teachers, students and researchers and aims to promote the collaboration between all parties involved in order to create better learning spaces for present and future generations. The Spaces for Learning initiative (2010) investigates the relationships between conceptual, personal, social, physical and virtual spaces and creativity.

Existing literature in innovative learning spaces has articulated some of the challenges involved in their design both in terms of the pedagogical agenda and their architectural and technological layout. However, less consideration has been given to understanding their lived use and experience.

When a design is put in place, it is uncertain, as to how the social context surrounding any designed artefacts will materialize; it is unclear in what ways people will adapt to what they are being offered and how learning may take place. Studies that consider innovative learning spaces in the context of their everyday use and lived experience can provide useful insights regarding design.

An example of such insights is provided by Sutherland and Sutherland in the book *Classroom of the future* (Mäkitalo-Siegl et al., 2010) that discusses a number of challenges for innovative learning spaces in all levels of education. Sutherland and Sutherland visited two newly built secondary schools and reconsidered their design based on how they are currently occupied and used. Their remarks come from a dual perspective: that of an architect and that of an educationalist. They compared the effect of various architectural features, such as corridors, of the two schools on the interactions that took place in them. They found that there were a number of physical transient spaces where “*semi-informal*”

learning was taking place such as corridors - traditionally considered as places to get from one point to another and for waiting in. In school A, the corridors were wide, lit with natural light and as a result “*street-like and casual conversations (between teachers, between students and between students and teachers) were possible and visible*”. In school B, the corridors had only artificial light, were leading off the atrium and were very narrow; also, due to some design issues (some of these corridors were functioning as fire escape routes) the students couldn’t decorate the corridor walls and piles of rubbish accumulated, as waste bins could not be placed. This example shows how design aspects change through occupancy. It also shows the effect they can have, either constraining conversations or facilitating spontaneous gatherings of students taking place in the corridors (and the atrium).

Very much related to this work in terms of how occupancy shapes architectural design, is the work of Christopher Alexander on patterns of architecture (Alexander, 1979). Alexander stressed the connection between spatial/ structural patterns and events as in people’s interactions and lived experiences. He was also interested in theorising this relation; understanding how spatial structures can support such events and consequently how/whether changes in those structures could predict events. For Alexander, ‘properly formed’ space prompts for everyday use, thus making it familiar and alive, while unfamiliar stays unused. Yet, a sensible (architecturally) pattern is not necessarily a successful pattern in terms of how the space is used; as Alexander puts it: “*A pattern only works, fully, when it deals with all the forces that are actually present in the situation*” and in practice before a structure is complete “*we have no reliable way of knowing exactly what the forces in a situation are*” (p. 285). Similarly to Sutherland and Sutherland earlier, Alexander’s work points to the importance of re-visiting

architectural and design choices after they have been deployed. Further, both works suggest that designing spaces in terms of basic architectural principles, such as proper ventilation and lighting is important for people's interactions – in this case for learning. But also they suggest other aspects of a building can promote “*visibility and potential of the in-between spaces for interactions*” (Sutherland and Sutherland in Mäkitalo-Siegl et al., 2010). Unfortunately, while Alexander's work is well known among architects and computer scientists, no mention of it was found in the literature of innovative learning spaces with respect to their design or evaluation.

Sutherland and Sutherland view the architectural design as a priority in this chapter but briefly consider technology as part of it. It is suggested that it should be an invisible infrastructure harmonious with the spatial layout: “*tools - digital and non-digital artefacts - should be taken into account and blend in with the overall architectural design*”.

Associated to one of the initiatives mentioned earlier (Spaces for learning) is an ethnographic report that was produced as a means of evaluation of the post occupancy of three interrelated innovative learning spaces (Melhuish, 2011). The investigation had a phenomenological analytic orientation and was carried out in three different innovative settings across two neighbouring universities that were built to support creativity. The study focused on issues of architectural space and the perceptions of managers and users. Among other findings, the students reported not using or considering the technology in the space as a crucial part of their learning. The innovation was acknowledged but not incorporated in practice. Similar were the reactions and comments for the innovation of the architectural

space. Not everyone found it to be particularly useful or contributing to the learning.

Further, in terms of the architectural space, the researcher stresses how issues of accessibility (physical dislocation, lack of public frontage) and managerial choices often interfered with potential learning benefits from these innovative spaces. The spaces were located in other buildings and were often hidden which made it hard for people to find them in the first place. Also, the managers had enforced a strict pre-planning approach which made it hard for students or tutors to use the space spontaneously as activities had to be booked. The author reports a significant fault in current assumptions of innovation for innovative learning spaces and criticises how innovation is perceived or realised in these three settings. Further, Melhuish suggests that the emphasis should be in understanding the role of the physical space itself and the social and cultural practices that are embedded in it.

2.2.4 Synopsis

This section presents the main motivation regarding the design of innovative learning spaces, their main characteristics as well as the challenges involved in their design and evaluation. Innovative learning spaces have been designed as a way to address more adequately the pedagogical needs of our time and support a student-centred learning approach. They aim to support a variety of formal and informal activities, collaboration and socialising by means of technological infrastructure and flexible architectural design. While many examples of such spaces exist currently in the UK, there is still no consensus about their impact or what should drive their design (Davidson, 2011; Shepherd, 2007; Temple, 2008, Radcliffe, 2009). Various approaches have been taken study-wise including

quantitative and qualitative methods with a primary focus on surveys, interviews and desk-based approaches. The few frameworks derived from those though do not take into account any observed everyday use of such spaces. Design guidelines have also been suggested but their content lacks specificity that can allow for meaningful design. We suggest that qualitative post-occupancy studies that investigate the everyday lived interactions of innovative learning spaces can address the above challenges and shortcomings. In the next section, we review examples of such studies from the field of HCI that illustrate the kinds of insights that such investigations might produce.

2.3 HCI and innovative learning spaces

As suggested earlier in the introduction, adopting an in situ methodological approach to investigate actual use in innovative learning spaces can help understand the complex interdependencies between technology, architecture and people - their co-configurations - and contribute towards informing their design. The field of HCI offers examples of the kinds of insights that such investigations might produce. Such examples will be reviewed in this section.

At the same time, it is important to stress that HCI can equally benefit from such investigations. Innovative learning spaces offer a unique opportunity for a number of technologies to be developed, used and evaluated within the broader context of learning activities. They are equipped with a technological infrastructure that aims to seamlessly support a variety of activities and allows for *“learning to take place everywhere in campus”* (Oblinger, 2006). Hence, it is within the interest of HCI to support the design process of such spaces and gain more insights as to the kinds of technologies that are relevant to their users.

There is a large body of work in HCI that looks at how technologies are used in situ in a variety of settings and applications. There are various methodological traditions that examine for example infrastructure from a social perspective and stress its relational nature with respect to organisational forms, practices, institutions that accompany it and make it possible (Star, 1999; Bowker et al. 2010). The purpose of this review, however, is not to provide an extensive list of all the available studies, but rather point out the benefits of studying technology in the real world and how such studies are relevant to informing the design of innovative learning spaces. In this respect, we focus on specific studies carried out in the real world that share some characteristics or offer useful insights for the

design of innovative learning spaces. One group of such studies looks at technologies that were designed to support communities (of students or academics) and enhance socialising and discusses issues that have arisen when these were used in situ. The next one looks at studies of technologies in public spaces, given that many innovative learning spaces are public. The last one considers studies where technology is placed in museums and galleries. Museums' digital interactive installations are often designed to support informal learning similarly to the ones in innovative learning spaces.

2.3.1 Supporting academic communities

One example of technologies that were designed to support communities of students is the Dynamo system (Brignull et al., 2004), a large publicly accessible interactive surface that was designed to support occasional meetings through sharing, displaying and exchanging media among students. Observations of the space where Dynamo was deployed 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 their existing practices and did not extend its functionality to other uses as the researchers expected. For instance, the students used features of the system to exchange photos, music and videos and leave personal messages and jokes to each other while the researchers expected them to leave comments and exchange files relevant to the teaching material.

In another example of a system designed to support serendipitous meetings and socialising between academics in a conference, its implementation showcased

the power of social etiquette in established institutions of practice². McDonald et al. (2008) describe how people appropriated three proactive displays that were situated in an academic conference to augment the participants' interactions; specifically to enhance the feeling of community, facilitate social networking and future collaborations. Participants extended the use of one of the displays in an innovative and fun way, which conflicted with the common practices and social conventions already in place and led to negative comments about the application. It seems that the established views and understandings of the social affordances of the conference setting that people shared were breached and as a result tensions emerged. It is possible that, if taken out of the conference context and the etiquette attached to it, the playfulness and creativity people exhibited would have been considered a positive outcome.

Another study shows the significance of the role of others in encouraging (or not) interaction with the technology. Brignull and Rogers (2003) note how a large interactive display placed in two different public settings, intended to entice people to contribute with their comments, made people feel like they were being watched. This made them feel vulnerable and more self-conscious of possible mistakes. These feelings also propagated to onlookers of the interaction and deterred them from participating simply because they were worried of potentially feeling uncomfortable. At the same time though, a critical mass of people – the honey pot effect – was found to encourage people to engage with the display. Brignull and Rogers (2003) suggest positioning the display along the thoroughfares of traffic (e.g. near a bar) to improve the ways in which the possible interactions

² By institutions of practice we refer to locations such as churches, schools, hospitals, theatres where the social etiquette and expected behaviours have been communicated throughout many years of practice and for that they are well established.

with a display are communicated implicitly to bystanders.

In another study, Hoppe (2009) describes a classroom intervention where PDAs were given to students and touch screens were embedded in their desks as a means to support and enrich the everyday social interactions already in place. Findings indicated that social interactions improved. A main reason for this was that the PDAs allowed students to move around and interact with others. Similarly, Liu (2007; 2008) suggested that handheld devices such as mobile phones, PDAs and tablet PCs provide students with autonomy, mobility and a sense of ownership that can “*cultivate the ubiquitous learning minds and enable learners to learn and live with the ubiquitous learning mind anywhere anytime*”.

Findings from the above studies already showcase that, while there can be significant benefits from integrating new technologies in academic and learning environments, issues may arise when these are used in situ. More specifically, the issues that emerged in the above related to social etiquette, pre-existing use and appropriation and facilitation.

2.3.2 Interacting with displays in public spaces

Many of the existing innovative learning spaces are public spaces and their technological infrastructure includes a variety of displays (laptops, interactive whiteboards, LCD screens). A number of studies in HCI have been concerned with studying how people interact with displays in public. While most of these studies refer to public urban spaces, we believe that there are still significant insights as to the interactional patterns and phenomena that occur.

The first study, similar to the last one mentioned in the previous section, reports on the social embarrassment experienced by the people. Also, it is

presented how activities that pre-existed in the space shaped its appropriation. In O'Hara et al.'s (2008) study, people appropriated the technology (a collaborative game) as part of the social identity of the space and the activity itself. The game was played in an open public space – a shopping and leisure area – and supported by large displays. It 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 in the space prior to the technology being introduced and the game and its 'technology' were appropriated in the existing context.

Social embarrassment has been reported to hinder people's interactions with technology especially in public or unfamiliar situations. More specifically, O'Hara et al.'s (2008) participants were particularly apprehensive about being judged. The visibility of potential mistakes magnified by the large displays and the fact that it took place in a public uncontrolled setting added to the wariness of the participants. In one of the locations where the study took place, it was found difficult to convince people to participate: *"No one wanted to be the first person to start the game and be the lone participant playing the game"*.

Similar hesitation in using an interactive interface as to that reported in O'Hara et al. (2008) was reported by Briones et al. (2007). In their study, an urban installation presented as a game projecting on the ground and using people's body as input was placed in different public locations within the city of Bath, UK, to investigate levels of social engagement. They discuss how users tended to watch others play before they tried themselves, so that they could learn the rules of the interaction and avoid social embarrassment. Also, they tentatively stepped over the perimeter of the installation until they were familiarised with the interface.

Moreover, while playing with the installation people who were unacquainted tended to define their territory and stay on one side while at the same time being careful not to cross the area of the other user, “*leaving a kind of mutual acceptance distance between users*”. After interacting with the installation, people commented on their experience or explained the rules to others, mostly their friends, but occasionally strangers as well. This sharing indicated how an interactive display in an urban environment can enrich social engagement and awareness.

Yet, it did not depend only on the interface itself but also on the physical surroundings and, most importantly, the social surroundings such as the atmosphere created by the audience, which can significantly deter or encourage potential interaction. Briones et al. (2007) also note that when members of the public encountered an unfamiliar artefact, they used prior experience and/or knowledge to describe the new artefact or to decide on their expectations from/about it. For example, people described the installation as a dancing carpet before they even interacted with it. Using perceptual cues, similarities and dissimilarities with familiar objects and drawing on previous experience and common sense are common strategies that people use to deal with uncertainty, especially when confronted with unfamiliar technologies.

As a final example of a study reporting on how the use of technology in public spaces relates to social norms, we note Humphreys’ (2005) ethnographic work on the use of mobile phones in public spaces. Humphrey discusses how people’s common understanding of the social norms concerning face-to-face interactions created dilemmas as to whether they would pick up the phone, affected how long they spoke on the phone and their posture while doing so. At the same time, he argues that the technology itself shaped the existing social

context. Broad adoption and use of mobile phones has transformed to some extent the social norms of what is accepted and what is not; interruptions of face-to-face interactions are considered more acceptable and the “*asymmetry of the traditional caller-answerer relationship*” is moderated.

Similar to the previous section, the studies of people interacting with urban public displays here illustrated a number of issues arising from their in-situ use. Mainly various forms of social context were shown to shape how and whether people interacted with the technology (e.g. social embarrassment, the role of an audience, pre-existing social norms and expectations). While innovative learning spaces are not urban spaces, many of them share a public status similar to that of urban spaces where unacquainted people co-exist and potentially collaborate briefly or over a period of time with technologies that may or may not be familiar to them.

2.3.3 Supporting informal learning in museums

Informal learning in museums enables the general public of all ages to participate and understand important debates and knowledge about science, design, art and technology. Hence, designing technologies and interactive installations for museums and galleries that can engage people into activities that promote informal learning has been a growing interest for HCI.

Heath and vom Lehn (2008) investigate how a number of such interactive installations are used in situ. The authors report on the significance of social interaction between visitors for discovering the qualities and the functionality of the installation. The visitors’ collaboration shapes “*their own and each other’s experience in and through the installation*”. The way the installation is designed together with its location in the museum space are important factors in achieving

such collaborations. The installation has to be located in a place that is visible to those who visit the museum and the actions that are available to the visitors need to be visible too.

In another study, Horn et al. (2012) report on how people (mostly families) interacted with a tabletop exhibit featuring a game intending to teach people about evolution and was designed for and deployed in a natural history museum. Horn et al. discuss the benefits of such interactive games for museums based on their motivational and social nature that can facilitate collaboration. The way people organise and coordinate themselves with relation to others when they play a game, including coaching and peripheral awareness are in practice valuable learning arrangements that can improve collaboration; and a variety of those were observed to take place around the tabletop surface during the study.

Another interesting finding from this work is how many visitors (especially adults/parents) were averse to the idea of playing video games in a museum. Many parents were overheard making comments on how it is inappropriate and that the purpose of this visit is not to play games but to learn, which the authors state as a potential pitfall of such interactive installations in museums. Similarly to the study reported by McDonald et al. (2008) earlier in this section, it seems that for some institutions there are strong pre-conceptions and assumptions regarding social etiquette and how people are expected to behave or what they expected to do and often technologies disrupt or interfere with these pre-conceptions. Assumptions and preconceptions equally inform and shape the design of such installations. As Heath and vom Lehn's (2008) in their extensive review of technologies in museums and galleries point out: "*the institutional environment in which 'interactive' exhibits and exhibitions are produced, the presuppositions that inform their design, the*

fragmentation of knowledge and experience they engender, the methods and criteria that inform their assessment, and, most profoundly, the difficulties their design engenders for co-participation in public domains, undermine the ability to predict and produce exhibits that support interaction and collaboration.”

The in situ studies of interactive technologies in museums reviewed in this section have illustrated issues of spatial as well as interactional visibility that can shape use; aspects of collaboration such as coaching and peripheral awareness; and, as previously, issues of social etiquette with respect to museums as ‘institutions’. What is equally stressed is the difficulty in predicting beforehand interactions, issues or tensions that might occur after the technologies have been deployed which points to the necessity of qualitative in situ studies.

2.3.4 Synopsis

The second part of this literature review presented studies of interactive technologies in the wild and aimed to show how such studies are or can be relevant to informing the design of innovative learning spaces. Similarly to how studying interactive technologies in situ is essential to uncovering their use and informing their design, in situ studies can be valuable to innovative learning spaces as their design shares similar characteristics and limitations.

The studies reviewed here show how to a great extent different aspects of social context shape people’s everyday interactions with technologies such as interactive and urban displays. They consider how interactions with technologies and each other are situated within the social life of people, spaces and objects. Issues of social etiquette, appropriation, facilitation and visibility have emerged as valuable insights. Our shared understandings and social conventions regarding institutions and etiquette shape our use of technology. The presence of others

affects the way we behave and interact; we change our behaviour/actions on purpose or unintentionally. The significance of social context for initiating engagement and establishing participation has further being recounted by the use and/or presence of facilitators. The comperes or the helpers contributed in the use and appropriation by helping understand its use, overcoming initial social embarrassment or difficulties in the manipulation of the interface, keeping the participants and the audience excited and engaged (Brignull and Rogers, 2003; Churchill et al., 2003; O' Hara et al. 2008). In terms of visibility, using perceptual cues already available in physical spaces, people's interactions with technological devices can be improved. It has shown how placing technology in areas where people meet or hang out socially, can potentially improve the chances of interacting with it. These points also resonate with the work on architectural patterns and technological infrastructure mentioned earlier (Alexander, 1979; Star, 1999; Bowker et al., 2010; Sutherland and Sutherland, 2010) regarding design and its lived situatedness. We believe that these and similar insights arising from in situ investigations can be valuable for the design and evaluation of innovative learning spaces.

2.4 Chapter Synopsis

This chapter presented the motivations, characteristics and challenges involved in the design and evaluation of innovative learning spaces. Across the innovative learning spaces literature, there is still no consensus about their impact or what should drive their design. Various approaches have been taken in studies of innovative learning spaces, but the outcomes derived from existing studies do not focus on or take into account the everyday use of such spaces and lack specific guidelines for meaningful design.

Citing existing studies of interactive technologies in the wild, the second part of this literature review demonstrated how such studies are relevant to investigating innovative learning spaces. The studies reviewed here show how people's interactions with technologies and each other are situated within the social life of people, spaces and objects. Our shared understandings and social conventions shape our use of technology.

In this thesis similarly to the above HCI studies, we adopt an in situ methodological approach to investigate actual use in innovative learning spaces that can help understand the complex interdependencies between technology, architecture and people - their co-configurations - and contribute towards informing their design. The field of HCI (and the specific studies referred to in this chapter) offers examples of the kinds of insights that such investigations might produce. It is important to stress that HCI can equally benefit from such investigations. Innovative learning spaces offer a unique opportunity for a number of technologies to be developed, used and evaluated within the broader context of learning activities. Hence, it is within the interest of HCI to support the design process of such spaces and gain more insights into the kinds of technologies that

are relevant to their users. In the next chapters we present our methodological approach and the qualitative post-occupancy studies that address the above challenges and shortcomings.

PART II
METHODOLOGY

Chapter 3

Methodology

Contents

3.1	Introduction	45
3.2	Methodological approach and analytic orientation	46
3.2.1	Ethnography	46
3.2.2	Situated action	50
3.3	Collecting, analysing and accounting	53
3.3.1	Collecting the data	53
3.3.2	Analysing the data	61
3.3.3	Accounting for the findings	64
3.3.4	Challenges in collecting, analysing and accounting	65
3.3.5	The researcher's role	66
3.3.6	Ethical considerations	68

3.1 Introduction

The research in this thesis aims to answer:

- How do people interact with the architectural and technological infrastructure and each other in innovative learning spaces on an everyday basis?
- How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?
- How do we account for the differences between actual and anticipated use of the spaces?
- How can spaces be designed or recover from breakdowns so that actual and anticipated use (re) align?

In this chapter, we present a description of the methodological approach and analytical orientation that allow us to answer the first two research questions. Three ethnographic studies following the analytic orientation of situated action have provided detailed descriptions of how people in innovative learning spaces interact with the architectural and technological infrastructure and each other; and examined those in contrast to the use that was planned and envisioned by their managers and designers.

Further, this chapter presents how the data from the three studies was collected, analysed and written for the purposes of this thesis and discusses the challenges involved, the role of the researcher and other ethical considerations.

3.2 Methodological approach and analytic orientation

This work asks what is the everyday use of innovative learning spaces; how people interact with each other, use the technology and other physical artefacts in the space. Further, this work is interested in how does actual use compare with what was envisioned by the managers and designers of those spaces. In the case where differences should be found between actual and anticipated use, we seek to account for those differences. To address these research aims, a qualitative methodological approach is appropriate, as the nature of the investigation focuses on issues of quality that need to be understood in context. Neither an interview based approach (such as that applied by Clemmensen 2004, for example) nor a focus group (as described by Preece et al. 2011; p. 365) of users of such spaces would be appropriate as both these methods can only provide reports on what people think they do, which often has been found to be different to what people actually do (Agar, 1980; p. 107). Similarly, an approach based on participatory diaries (as described by Preece et al. 2011; p. 258) suffers from the self-reporting limitation and cannot account for the root of potential differences between actual and anticipated use. The methodological approach that provides the researcher direct access to the everyday life of innovative learning spaces, and hence, can provide answers to our research questions, is the ethnographic approach.

3.2.1 Ethnography

Ethnography as a methodological approach is combinative, immersive, detailed and contextual. It considers how people's practices and interactions become immersed in their everyday routine to the extent that they are often not recognized consciously by the actors themselves. The ethnographic approach provides the benefit of combining data collected from in-situ observations and

semi-structured interviews to understand those practices and interactions. For example, interviews can inform the observations and help participants reflect on their actions, which, in turn, helps the researcher understand the ways people interact in those spaces.

Ethnography has been widely used by anthropologists and sociologists. Since the 80s, it has become a popular approach for HCI. As presented earlier in the introduction and literature chapters, the ubiquitousness of technology in all facets of everyday life has motivated a shift towards many of these technologies being evaluated in the wild (Chamberlain et al. 2012; Dourish et al., 2004; Intille et al., 2005; Marshall et al., 2011; Rogers, 2011) using qualitative methodologies such as ethnography for long-term and/or in-depth investigations.

Simply, Hammersley and Atkinson (2007) suggest that ethnography is what ethnographers do with the following characteristics:

- 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
- Data are gathered from a range of sources but, participant observation and informal conversations are usually the main ones
- 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
- Investigation of a small number of cases, sometimes just one case in detail
- 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.

Ethnography is directed towards the production of a rich and concrete description of the situation, rather than an abstract and general one. Studies from different fields of practice, using 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. Further, participant observation allows for observing the setting, interviewing the participants and also experiencing what takes place first hand by participating (Taylor, 1994).

The use of ethnography in this work focused on producing detailed accounts of the situated interactions that took place in three innovative learning spaces and contrast those with their anticipated use. The activities observed were considered and treated as 'strange'. No preliminary hypotheses were formed beforehand and no particular feature of use or interaction was given a priori significance. The collected data consisted of fieldnotes originated from observations and casual conversations, semi-structured interviews, photos, audio and video recordings, and physical and digital documents. Data collected from the settings were analysed considering Suchman's work on situated action in terms of tensions between situated actual use and anticipated use. Analysis further allowed for other themes that emerged as central in terms of how the space was used to be considered. Given this particular interest on anticipated use and expectations, the rapport with the managers and designers of such spaces as obvious gatekeepers provided the researcher with a unique opportunity to gain insight into the managers'/designers' ideas, feelings, aspirations and concerns about the space and its use.

Ethnographies in HCI vary in duration and the kind of ethnography that is appropriate at any given time relates to the specifics of the research question and what is expected to be understood. On the one hand, there is ethnography that requires a long period of fieldwork, where the ethnographer is fully immersed in the environment observed; on the other, 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. For example, research that is engaged with understanding work cultures and practices traditionally tends to be long-term. The ethnographic approach is often used as a way to understand people's fleeting or short-term experiences, such as interactive museum installations that often are only available for a small period of time (Hornecker, 2008; Reeves, 2005a; Ciolfi, et. al, 2007). The duration of the ethnographic studies for this thesis lasted as long as what was considered a sufficient time for gaining an understanding of the anticipated use, and the everyday use of each setting. This is further discussed in section 3.3.1.

3.2.2 Situated action

The analytic orientation of this ethnographic work is located in the theory of situated action and the work of Lucy Suchman (2007). Suchman critiqued the mismatch between developers' assumptions on how people use technology and how this work is actually accomplished in the real world (Suchman, 2007; Suchman, 2011). In particular, she analysed how people used a photocopier machine. Her work showed how people do not follow a specific procedure, even for the 'simple' task of photocopying. Rather their plans and actions adapt, depending on the specifics of the situation: "*the resources and constraints afforded by material and social circumstances*" (Suchman, 2007, p. 177). Human interaction and knowledge are inextricably bound to the world: what people do, how they get to know about things is a result of their being or interacting within the physical world. Instead of formal models of knowledge and action, Suchman suggests exploring the relationship of knowledge and action to the particular circumstances in which interaction occurs. In this sense, action is organised as the result of the moment-by-moment interaction between people, artefacts and their environment. The design of technological artefacts can benefit from studying interactions where they actually take place: in the real world. Our work applies this to the context of innovative learning spaces.

Suchman's work was placed in a different context than the work presented here. It was oriented very much towards the –at the time contemporary – debate of whether and how machine intelligence or some form of it can be accounted for; still though there are common threads. To some extent the same way part of the AI community assumed that by adding for example natural language instructions to a photocopier, its intentionality will become more legible and thus the interaction and communication with humans more natural; managers and designers of

innovative learning spaces assumed that adding specific adaptable design features (mobile technologies, movable furniture) that have worked for some spaces, will work anytime for all spaces in supporting the activities in the space. Essentially, the design of innovative learning spaces is presented and treated in the relevant literature as a rather straightforward one-size-fits-all, in the same way that a set of plans was attempted to be created for machines before considering or evaluating them in the locality of their environments and perspective users.

Following from Suchman's work, this thesis takes a critical stance and suggests that the interactions taking place in innovative learning spaces are not as straightforward; instead there are co-constructions of complex interdependences between people and artefacts situated in context. We suggest that the design of innovative learning spaces can benefit from a change in perspective. Grounding the design in empirical evidence from qualitative, in depth investigations can help with building generalisations (such as design guidelines) while maintaining the locality of the situation. As Suchman says, situated action is neither pre-determined nor random and therefore it can be used to "*explicate the relationship between structures of action and the resources and constraints afforded by material and social circumstances*". Plans, rather than determining action, make more sense as a resource for action. Understanding interactions in situ involves considering them as dynamic co-constructions, configurations: all parts working together to create something interesting and intelligible. Context provides a point of reference: a frame where associations can be generated and a means that allows distinctions to be made. But context also indicates what distinctions are useful to be made. It is possible that some distinctions are only useful in some settings.

In our case what this means is that situated action might be able to provide insight to the resources for the interpretation of innovative learning spaces, a way

to refine the availability of design choices or their appropriateness. Potentially a good starting point for this would be to focus and learn from the tensions, from breakdowns, things that did not go as anticipated in those spaces and then consider what these tensions reveal for the implicit assumptions that designers and users make within their everyday interactions.

3.3 Collecting, analysing and accounting

The ethnographic approach adopted in this thesis focused on investigating and providing detailed accounts of the everyday interactions that took place in three innovative learning spaces. The circumstances of each setting varied and as a result there were different methodological issues to address, different data available to collect and hurdles to overcome. In the following sections, we present how and what data were collected for each of the three settings, a description of how data was analysed, a reflection on the role of the researcher, the ethical considerations, as well as a section on the methodological challenges involved when undertaking real-world research. The particulars of the methodological approach undertaken are also presented separately in each of the study chapters.

3.3.1 Collecting the data

Each of the settings studied was different – in terms of their spatial layout, but also in terms of their running and managing circumstances. That meant that the way data was collected also differed, as it had to be decided and negotiated with respect to its individual circumstances.

The settings

The three settings studied were Dspace, Qspace, Cspace. Dspace, was an innovative learning space in a library building designed to be a space where people would come to explore new ideas and knowledge regarding teaching and learning in an informal playful manner; try out new technologies; and serendipitously meet others with common interests and consider new collaborations. Dspace, apart from being an innovative learning space, was also located in the researcher's university

campus³, which made it available for purposes of study by means of opportunity. For this first study, the initial questions considered were how this innovative space was appropriated by its users, how were the diverse activities realised within Dspace and what was the role of the technology.

The second setting studied was Qspace. Qspace was an innovative learning space primarily designed to support creativity in teaching and learning. Again there was some serendipity involved but mainly Qspace was chosen as the next setting to study due to its highly reconfigurable layout and the fact that it was facilitated. The initial outcomes from the analysis of the previous setting were indicating that the Dspace was used differently to what it was anticipated, that the technology in the space was rarely used and that users were confused as to the purposes of the space. Issues with the location/layout of the space and the kind of facilitation provided seemed associated to the above findings. Based on this, the researcher chose the next setting to be different in those two perspectives (facilitation, location/layout).

The third setting was Cspace. Cspace was an innovative learning space designed to support collaborative work between students as well as various other activities (individual study, practical sessions, programming etc). Cspace was chosen as its design was less unconventional to Qspace's: the initial analysis of Qspace's data had shown that the unconventional design was relating to the users' not being able to use the technology and the managers' having to continuously provide facilitation. Also, Cspace's spatial layout was rigid which was a significant difference to the previous two settings. Again a central focus for this study was to examine whether and how multi-purposeness was negotiated and realised in an

³ Actually Dspace was the space that introduced the researcher to the notion of innovative learning spaces. Similar to other students, the researcher was shown Dspace during her induction tour and explained its agenda which sparked an interest for the investigation of such spaces.

everyday context. This included examining the use of the technology and people's interactions with the space and each other.

Duration of the fieldwork

The duration of the fieldwork for each setting varied from periods of continuous observation and recurring short-term visits for a number of times, depending on the specifics of the setting's operation and use and what was considered a sufficient time for gaining an understanding of the setting. The study in Dspace was carried out two to three days a week over a period of two months (February - April 2008). Dspace was open all day (library working hours) during the whole year with the exception of national holidays. The whole spectrum of daily activity was covered. Each day was divided into time zones and observations were made for one time zone per day. The three time zones were: morning (9-12), noon and early afternoon (12-3) and late afternoon (3-7). The majority of the data was gathered from the noon-early afternoon sessions, since the researcher found that there was little occupancy or activity in the other two sessions.

Qspace was only open when an event took place. As a result, it could not be studied in the same way as Dspace. Two events were studied taking place in Qspace. The researcher visited the space before each event to case the setting for the purposes of the study. The first event was a workshop that took place in September 2008 (11-12th) and the second a public event, called 'The Scrapbook', in December 2008 (16-18th). For the workshop, two visits were carried out to observe the planning sessions for the event.

Cspace was open every day from 9am until 9pm during the whole year with the exception of national holidays. Data collection in Cspace was completed in three phases. This provided the opportunity to observe a broad diversity of its everyday practices. The first observational phase took place in May 2009 for a

three-day period. This coincided with the beginning of the Easter term exam period; as a result examination sessions, individual and group study sessions for exam purposes were taking place. The second phase took place in October 2009; a week of observational sessions was carried out. The second phase took place at the beginning of the academic year so that newcomers⁴ interaction could be observed. The interest in newcomers arose out of findings from the Dspace study, where newcomers' assumptions and use of the space were found to be influenced by the activities already taking place in the space. The third phase of the study was conducted in February 2010 for a period of two days. During this period, issues that emerged from the analysis of the previous two phases were followed up. In particular, a focus was on findings emerging from the observations in October relating to collaboration, seating and use of the technology.

Data collection techniques

Data was collected through a variety of techniques: participant observation (primarily), semi-structured interviews, sociograms, and questionnaires. The data collected consisted of fieldnotes, photos, audio recordings, video recordings, printed and digital documents. The tables below summarise (see Table 1) what techniques were used and data collected in each of the settings. Decisions regarding what to record and how best to record the data were based on the researcher's initial visits. Reasoning for the data sources and the techniques used in each setting can be found in each of the study chapters. A more detailed description of what was collected follows.

⁴ The term *newcomers* is chosen on purpose instead of first-year students as our study established (from casual conversations and the results from the questionnaires) that the great majority of newcomers were second-year students.

	Dspace	Qspace		Cspace
		Workshop	Scrapbook	
Participant Observation	✓	✓	✓	✓
Semi Structured Interviews	✓	✓	✓	✓
Sociograms	✓	X	X	X
Questionnaires	X	X	X	✓

	Dspace	Qspace		Cspace
		Workshop	Scrapbook	
Field notes	✓	✓	✓	✓
Audio	✓	✓	X	X
Video	X	✓	X	✓
Photos	✓	✓	✓	✓
Documents	✓	✓	✓	✓

Table 1 On the top table, the techniques used for the data collection and on the bottom one, the types of data collected for each of the settings.

Fieldnotes and the sociogram

Fieldnotes were taken in all three settings and they were the main source of collected data. Fieldnotes were hand-written in a notebook, while in the setting without interfering with the activity taking place at the time. When this was not possible, key words were noted regarding what was taking place and were later expanded at the first given chance (when the researcher was alone or after the observational session). The fieldnotes comprised descriptions of the interactions observed as well as quotes (whenever possible) or reconstructed text of the casual conversations that took place in the setting between users of the space and between the researcher and users of the space.

After considering different techniques of note-taking, it was decided that for Dspace it would be useful to capture the interaction in the room with a sociogram (Sanger, 1996). Sociograms have the benefit of allowing the quick and fluid recording of simultaneous people interacting with artefacts and each other, capturing their multiple trajectories and the duration. The sociogram developed for Dspace comprised a simple schematic diagram of the space; showing paths that people take around the room and any technology that they interacted with (see

Figure 3.1). In the end though, the traffic from people's interactions in Dspace was low and as a result the use of the sociogram was not as central as it had been expected.

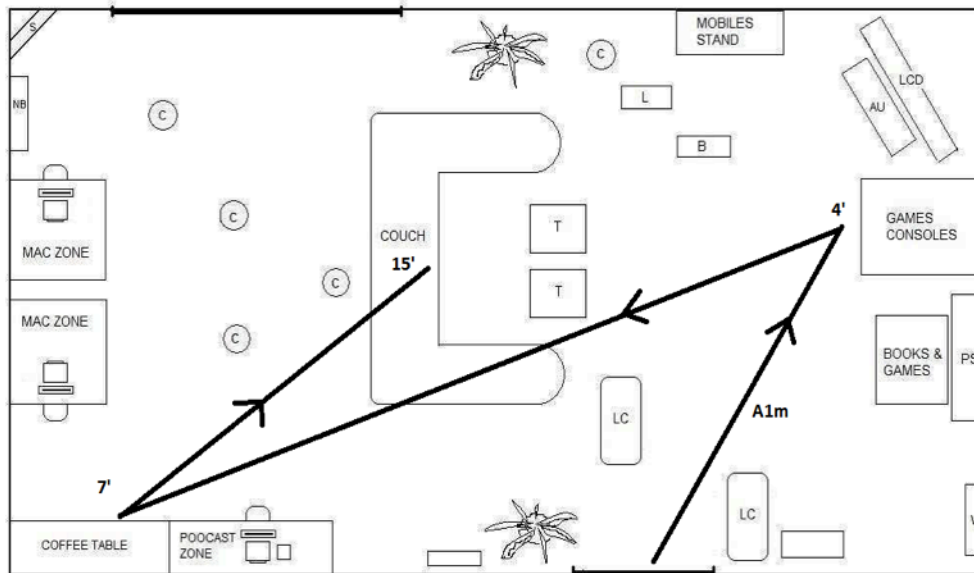


Figure 3.1. An example of the sociogram used in the study: it shows male participant A1 entering Dspace, moving towards the shelf where the game consoles are, where he spent 4 minutes, then headed to the coffee machine, got a coffee and then sat on the couch for 15 minutes to drink his coffee. "C" stands for chairs, "LC" for lounge chairs, "T" for tables, "PS" for projector screen, "W" for whiteboard, "NB" for notice board, "L" for Lego, "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

In conjunction with the sociogram, an observation form⁵ was designed to track the date/time, start/end of each activity and also key words that would be used for on the spot note-taking. It also provided a memory-triggering mechanism for extending the fieldnotes after the observational session was over (see Schatzman and Strauss, 1973, p. 95 on the use of key words). On the bottom of the form, a blank space was provided with the heading '*General comments*' so that anything else that stood out during the observations could be added (as advised by Hammersley and Atkinson, 2007, p. 143).

⁵ Refer to appendix 1 for the observation form

Semi-structured interviews

Semi-structured interviews were conducted in all three settings. This particular type of interviews was chosen as it provides structure while still being open-ended, which allows for new topics to arise. In Dspace, one semi-structured interview was conducted with the manager of the space, one with a core user of the space and six with first-time users of the space. In Qspace and Cspace, semi-structured interviews were conducted with one of the managers of each space. The interviews with the managers aimed to inform the researcher's understanding of the design and anticipated use of each space while the ones with the users aimed to provide information about the specifics of the use. Figure 3.2 shows as an example the script of the semi-structured interview with the manager of Dspace and the remaining of the scripts used can be found in Appendix 5. The questions are formed in an open-ended way and aim to establish an understanding of the space's vision, design and anticipated use as well as how its current use is viewed by its managers.

- Interview script – Dspace manager
- How did you first come up with the idea of making <name_of_space>?
 - What exactly is <name_of_space>?
 - Did you hear about other similar spaces that helped or inspired you into designing <name_of_space>?
 - Who can use <name_of_space>?
 - What can somebody do in <name_of_space>?
 - What would be the ideal use scenario of <name_of_space> for you?
 - What feedback or comments do you get from the university staff or visitors who use it?
 - Do they suggest changes?
 - Do you know any similar spaces that were created after <name_of_space> in other universities?
 - Any future plans?

Figure 3.2 Interview script for the manager of Dspace

Questionnaires

As part of Cspace's data collection, questionnaires were used (see Appendix for samples of the actual questionnaires). Questionnaires were handed out to the student population of the practical sessions. The reason behind the questionnaires was to gather some collective information about when the students started using Cspace, whether they used other spaces in campus to study and also what they thought about Cspace. The questionnaires mainly served as a way for the researcher to corroborate some of the themes already emerging from the observations.

Printed and digital documents

Printed and digital documents were collected in all three settings. For the most part, these documents included information that was used to gain an understanding of the aims for which each setting was designed and establish its expected use. For example, digital documents consisted of text from the settings' website or other electronic sources such as publications and advertising material of the setting. For the first study in Dspace, printed (advertising leaflets and postcards, internal newspaper) and digital (information from the official website, PowerPoint presentation) documentation was collected. For Qspace, information from the official website and email communication were collected as well as some of the printed informational material that was being distributed in the Scrapbook event. For the Cspace, information from the official website and email communication and printed advertising leaflets were collected.

Video footage

Video recordings were collected only as part of the Cspace study. Video feed of Cspace was being recorded on a daily basis through the space's infrastructure. Before the third visit to the setting the researcher had asked for permission to

acquire a copy of the recordings kept during the time of the study to be used as supportive material to the fieldnotes collected. Permission was granted and video recordings were collected for each booth, enabling the researcher to examine the interactions during the practical sessions. However, due to some technical issues with the software, recordings were only stored for one of the two days of the observation and they were without sound.

Audio recordings

Two of the managers' semi-structured interviews were voice recorded (Dspace and Qspace)⁶. In addition, the planning meetings of the workshop event in Qspace were audio recorded for practical reasons.

3.3.2 Analysing the data

The collected data was analysed based on the thematic analysis method (Braun and Clarke, 2006) with the particular orientation of situated action (Suchman, 2007). We based our investigations on activities – the actual, situated use – that involved people interacting with each other and with the architectural and technological infrastructure within the spaces. A main focus was on potential tensions between actual and anticipated use and accounting for those. Thematic analysis is “*a method for identifying, analysing and reporting patterns within data*”. In this work, thematic analysis was used for its “*contextualist*” nature – it can report the way individuals make meaning of the world and in turn how the world (social, physical) shapes those meanings.

Fieldnotes from the participant observation were the primary source of data informing actual use for each of the settings, with the rest (photos,

⁶ The semi-structured interview with the manager of Cspace was not audio-recorded but notes were kept.

sociograms, video recordings, questionnaires, documents) being supportive material. Data collected from the semi-structured interviews and documentation (printed and digital) were used to inform the anticipated use for each space.

Themes emerged by scrutinising and organising the data in a number of ways. First, instances from the data were grouped through a process of physical sorting: multiple paper copies of the fieldnotes were physically arranged and re-arranged in groups. Often one instance from the fieldnotes could be associated with a number of different groups. During this process, concept maps representing the interrelations between the different groups were drawn or created using post-it notes until abstract themes were formed (see Figure 3.3).

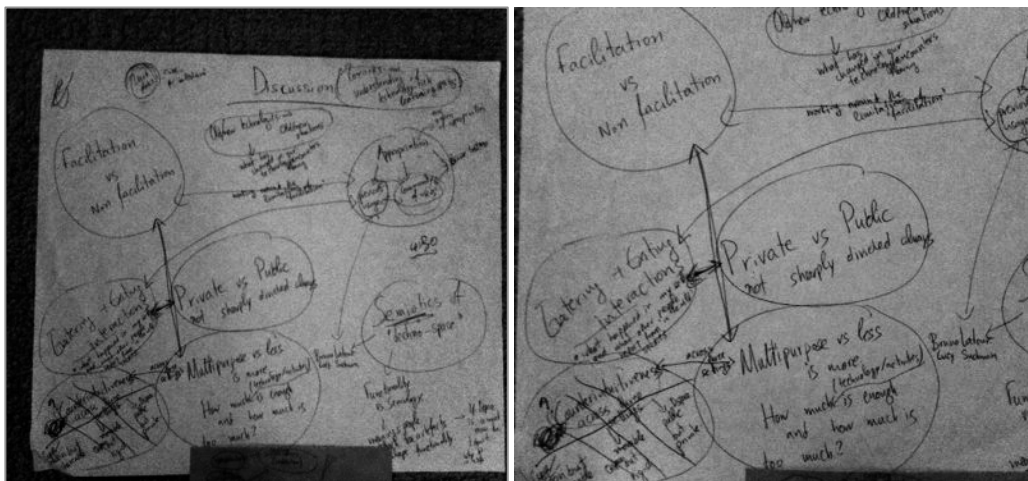


Figure 3.3. Examples of the concept maps sketched for the analysis

The data was revisited several times to confirm – or disconfirm – the initial themes that were then refined through that process. For example, during the first data collection phase at Cspace, students were observed to bring their own laptops and plug them in the existing infrastructure. No instance of the students using the existing laptops and tablet pcs was noted. In the second phase of the data collection, this finding was ‘disconfirmed’ to a great extent as students were observed using the devices in the space and only rarely their own. This led to a reconsideration and refining of the data, by focusing on the activities that were

supported each time – in the first phase, it was exam period so students were either using Cspace to study or were being examined on projects via slide presentations so they were using more their devices. In the second phase, it was the beginning of the semester and the students were using Cspace either between their lectures (for lunch, browsing etc) or for the practical sessions where they had to access the course material in the departmental server and this was easier through the university's infrastructure. These distinctions were further refined in the third phase and informed the 'Use of technology' section in Chapter 6. Written reports of the analytic themes and descriptions were also discussed with others.

An example of the data analysis process follows: fieldnotes of what people *were observed to do* were organised in groups: <reading>, <browsing the web>, <showing slides>, <chatting informally>, <being interviewed>, etc. What people *reported doing* (data from interviews and casual conversations) informed additionally the existing groups. Then these groups were further organised in broader categories such as <people interacting with technology> and <non-technology-related interactions> or <group activities> and <individual activities>. Those thematic groups were then considered in terms of what a space was designed for – as established by the manager's interview and other documentation such as advertising material (leaflets, website). This consideration revealed for the above example tensions between actual and anticipated use and these were further presented in the written ethnography as part of the discussion section of that study chapter (see chapter 4 'Actual use' and 'Actual versus Anticipated Use'). The process of the analysis as discussed previously was not linear; multiple iterations of synthesising and analysing data took place until the themes that addressed the research questions settled. Further, as explained earlier in section 3.3.1, the analysis of the findings from one setting informed to some extent the choice of the next

setting and issues that were a priority for the researcher to confirm and disconfirm. For instance, the role of facilitators was initially hinted in one study and then pursued for further exploration in subsequent ones. Another level of analysis took place during the writing of the ethnography: considering all the themes from the different settings, these were refined further into a coherent and detailed account of the interactional work observed.

3.3.3 Accounting for the findings

Confining and unpacking the richness and messiness of the social world in one piece of writing is impossible. As a result, the writing of the ethnography is closely interrelated with the analysis. Themes arising from the analysis, were synthesised and organised into a coherent account that “*does justice to the complexities of everyday life*” (as Hammersley and Atkinson put it, 2007, p. 193), shaping the analytic narratives further.

In the chapters describing the three studies, detailed descriptions are provided. The analytic themes described in this work are supported with examples that are grounded in the data. The examples were chosen based for their representativeness in depicting accurately and comprehensibly what took place in the settings. Further, each of the study chapters includes a discussion of how actual use compared to anticipated use of each space drawing on implications and reflections that were developed from the analysis. A broader discussion is provided in Chapter 7 that ties together the analyses from all three settings and shows how the analyses answer the research questions. An explanatory and sensitising framework is proposed that describes three factors that need to be taken into account when considering the design of innovative learning spaces.

3.3.4 Challenges in collecting, analysing and accounting

As all research done in the real world outside of the safe-heaven of a lab setting, the work presented in this thesis encountered a number of challenges while being carried out. Some of the challenges were similar to those potentially encountered in any qualitative investigation in the wild: establishing contact with participants and gatekeepers, sampling and choosing settings, negotiating and acquiring access – not just to the setting, but also to other identified sources of data that can inform the research and provide answers to the research questions (multiple gatekeepers) – and maintaining contact with participants over a period of time. Part of dealing with these challenges means that the researcher has to be operationally flexible at all times. Also, he/she has to embrace the fact that these challenges are shaping substantially how and what is being studied, and consequently they are part of the context (the setting) and should be treated as such. Flexibility towards the real world research challenges is an important part of the ethnographic approach and it is being addressed through the researcher's responsiveness and reflection, and through the variety of collection and analysis tools and techniques that support adaptation to the best extent possible.

In this research, a main challenge has been adjusting the data collection to the setting at hand. In Cspace for example, the booth design of the space meant that only one or two of the booths could be observed at the same time. That made it impossible to observe the activity in all the occupied booths without the help of the video. At the time of the first and second study phase, the researcher addressed this issue by observing one booth for a short period of time and then moving to another one. In the third phase, the video feed from the booths was used to complement the analysis of the fieldnotes.

Another challenge was with Qspace being open only when an event took place. This meant that in contrast to the other two settings, Qspace's usage could not be observed continuously over a long period of time and further it meant that the anticipated use of the space had to be considered with respect to the separate goals of each event taking place in it. To address this, the researcher observed the individual events that were hosted in Qspace from September until December 2008. Another event was arranged to be observed in March 2009 but it was cancelled so the observation was not carried out. Apart from the challenges with data collection, data analysis presented its own challenges as it involved considering and synthesising a significant volume of data from diverse sources into one comprehensive account of how those three innovative learning spaces were used in the everyday context of people's interactions with each other, the technological and architectural infrastructure.

While such challenges are not unfamiliar to those who pursue ethnographic or qualitative research in the wild, what is important to note at this point is that studies of similar nature have not been undertaken before for innovative learning spaces. In this respect it is important to stress their existence as future reference for those who wish to undertake similar research. In addition to the challenges presented in this section, an equally useful remark concerns the role of the researcher as a participant observer in those settings, which is reported in the following section.

3.3.5 The researcher's role

Traditionally in sociology and anthropology, participant observer refers to the researcher being immersed in the community under investigation and being identified as a member of that community (Taylor, 1995).

Regarding this work, the researcher was not a participant observer in the traditional sense (of being immersed or a long term member of the community) for all the three studies. Various degrees of participation were assumed for each of the settings. Using Spradley's (1980) participant observation classification, for Dspace, the researcher was a complete participant observer, while for the other two settings participation varied between active (Qspace workshop event and Cspace practical sessions) and moderate (Qspace Scrapbook event and Cspace). The specifics of these various participations are elaborated next.

In Dspace, I was indeed a fully-fledged participant, as I was a member of the university where the setting was located and, similar to other students and academic staff, had access and frequented the space. For Qspace, I was an active but also informed participant of the workshop, in the sense that I had knowledge of the whole planning process that had taken place before the workshop and also I was a participant to the event. For the Scrapbook event in Qspace I was a participant of the same nature as all the other visitors of the event. In Cspace, I used the space same as other students did for formal and informal activities (mostly the latter), but it was acknowledged (both by students and tutors) that my status was different to the rest of the students that frequented the space. I was a student in Computer Science but I was also carrying out a study. For Cspace I was also part of one of the groups in the practical sessions during the second phase of the study and together with three other students, I started drafting software engineering requirements for the project of our client.

The advantages of such a participation involved gaining a unique insight to the spaces from the users' point of view. In Dspace for example, similar to other users of Dspace, I experienced first-hand having trouble using the projector or the

LCD screen to play with the Wii or feeling awkward being co-present when others were having meetings. In Qspace, I was faced with the same hesitation and embarrassment when starting to write on the walls, or the same frustration when needing a surface to work with others or simply to put my cup of coffee. For Cspace, the first thing that crossed my mind when sitting in one of the booths and using the space facilities was how I felt being monitored. Until the end of the study, I never managed to get over this feeling that there were records of myself and someone could access what I have been doing for the last few hours in the space. As a result of this feeling of surveillance, I found myself positioning in the booth in a way that my screen was not visible, nor my notes. The other thing I realised in Cspace was how the booth design prevented or obstructed to some extent my awareness of others. Often I had to go and check the adjacent booths to see whether someone was occupying them. Equally, my presence in the booths startled people who have been in the space for a while chatting without realising that someone else was there too.

3.3.6 Ethical considerations

The study design for each of the three settings and accordingly all ethical considerations surrounding it, followed the ethical guidelines and code of conduct of the British Psychological Society (BPS, 2009).

The varying circumstances of each setting meant that there were different ethical considerations to be addressed. In each setting the ethical decisions were based on the researcher's sensitivity to the needs of the managers, the users and the needs of the study. Dspace was a public space in a university library building of which the researcher was a member and therefore had access to. The managers of the space were informed about the study; regarding the users of the space, it was

not feasible to acquire informed consent of each one individually as there was no predefined group and the researcher had no control over who entered the space⁷. Hence, ethical concerns were addressed during the observations in the following way:

1. the researcher ensured that there were no circumstances that could harm the participants,
2. the observation protocol followed was the same as it would be in any public setting i.e. in a street, a square, or public event, and
3. users' interactions were only recorded via hand-written fieldnotes. No photos⁸ or any other recording were taken while people were using the space.

Where semi-structured interviews were conducted, participants were informed about the purpose of the study and were given the option to withdraw at any point. On withdrawal any data related to them would be deleted and would not be included in the analysis.

For Qspace, similarly to Dspace, the managers of the space as well as the organisers of each event were informed both verbally and in written form about the study taking place, including the purposes of the study. They were free to ask questions or withdraw their consent at any given time, in which case the study would not continue. Regarding the participants of the workshop, they were also informed about the study taking place both in the form of an announcement

⁷ In retrospect, the same approach that was later followed for Cspace – that of posting the information sheet of the study on the walls and entrance of the space – could have been applied in Dspace too. Given Dspace was the first setting observed, the researcher was not fully aware of such alternatives.

⁸ Any photos of people provided in Chapter 4 are reconstructions.

before the workshop began and also through individual information sheet and consent forms that were distributed as part of their workshop folders (see Appendix). The consent forms were signed by the participants and collected by the researcher on the first day of the workshop. For the Scrapbook event, the circumstances were similar to that of Dspace: the researcher had no control over who would enter the space and it was not possible to disseminate informed consent forms to everyone in the space. To address this, the researcher recorded hand-written fieldnotes of what took place in the space and sought the approval of individuals appearing in photos. Verbal permission was granted after they had been briefed on the purposes of the study.

Finally for Cspace, the manager of the space was informed about the scope of this study (research questions, methodological approach) and the reasons why Cspace was chosen among the settings under investigation. Following, she granted access to the space and introduced the researcher to all tutors that might be using the space. Accordingly, the tutors using the space were informed in advance about the details of the study (research agenda, methodological approach) and agreed to the researcher's presence in Cspace as well as to data being collected in the form of fieldnotes. Further, in the later phase of the study all official gatekeepers (managers, tutors) verbally agreed for the researcher to have access to the booth video footage that was being recorded daily by the university for their own purposes. The university informed students in the space that they were being recorded via signage around and outside Cspace.

Upon the manager's and tutors' recommendation, students were informed about the study taking place i) verbally by the researcher; ii) verbally by the tutors and iii) in written form – both via individual hand-outs and in the form of posters put up by the researcher on the walls of Cspace. At any point, participants

(students and tutors) were given the choice to opt out, at which point their data would be deleted and not included in the analysis.

PART III

THE

ETHNOGRAPHIC

STUDIES

Chapter 4

Dspace

Contents

4.1	Introduction	74
4.2	The study	75
4.2.1	Choice of setting	75
4.2.2	Data collection	75
4.2.3	Data analysis	77
4.2.4	Participants	77
4.2.5	Ethical considerations	78
4.3	The setting	80
4.3.1	Setting description	80
4.3.2	Anticipated use	83
4.4	Actual Use	87
4.4.1	A confusing space	87
4.4.2	A private space	89
4.4.3	Minimal use of familiar technological devices	93
4.5	Discussion	99
4.5.1	Actual versus anticipated use	99
4.5.2	Appropriation and facilitation	104
4.5.3	Summary of outcomes	106

4.1 Introduction

Dspace, was an innovative learning space in a library building designed to be a space where people would come to explore new ideas and knowledge regarding teaching and learning in an informal playful manner; try out new technologies; and serendipitously meet others with common interests and consider new collaborations. Dspace, apart from being an innovative learning space, was also located in the researcher's university campus, which made it available for purposes of study by means of opportunity. For this first study, the initial questions considered were how this innovative space was used by its users, how were diverse activities realised within Dspace and how its use matched the expectations of the managers.

4.2 The study

Dspace was the first setting observed for the purposes of our investigation. In the following sections we describe the reasoning for choosing Dspace as our first setting, as well as the specifics of the methodological approach for this setting (data collection, data analysis).

4.2.1 Choice of setting

Dspace was an innovative learning space situated in the campus of the researcher chosen for our initial study for three main reasons:

- a) It was designed to support a variety of learning activities
- b) it was accessible
- c) it was public

First, Dspace was characteristic of an innovative learning space: it was designed to be a comfortable space, embedded with technological artefacts and flexible furniture, both chosen to accommodate a variety of exploratory and social activities. Second, Dspace was located on a university campus, which made it accessible to those who were members. Third, Dspace was public, allowing entry and the ability to observe without needing special authorisation.

4.2.2 Data collection

To tackle the question of how the envisioned use of Dspace compared with the actual lived experiences and interactions taking place, an ethnographic approach that combined a variety of data collection tools was considered appropriate. As discussed earlier (Chapter 3) in detail, the ethnographic approach allows for data collection tools to be chosen depending on the specifics of the setting. For Dspace, it was decided for the participant observation an observation form that included

the use of a sociogram (Sanger, 1996) would be used and in addition semi-structured interviews would be conducted to provide supportive data information. The process for this decision making is described below.

To decide upon the specifics of the data collection, a trial observation week was first conducted. For the first three days, a couple of hours per day were spent in Dspace observing what took place in general; identifying possible key areas and exploring ways to optimize data collection (such as strategic positioning with a panoramic view of the room, efficient note-taking etc). Moreover, after trialling different techniques of note-taking, it was decided that for this study it would be useful to capture the interaction in the room with a sociogram, as it allowed for the quick and fluid recording of simultaneous people interacting with artefacts and each other (for details see section 3.3.1).

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 were recorded via fieldnotes mainly by using the observation form described earlier. To address the issue of representativeness, each day was divided into time zones and observations were made for one time zone each day, so that the whole daily spectrum could be covered by the end of the study. The three time zones were: morning (9-12), noon and early afternoon (12-3) and late afternoon (3-7). However, the majority of the data was gathered from the noon-early afternoon sessions, since the researcher found there to be little occupancy or activity in the other two sessions. For more than half of all the observational sessions Dspace had no visitors.

Semi-structured interviews were conducted with one of the managers of the space, a regular user and six first-time users i.e. individuals who had either never been in the space before or had never used it. The interview with the Dspace manager was audio recorded. The other interviews were not audio recorded as it was felt it might affect the casual flow of the conversation that was struck up with visitors when they walked into the space. The semi-structured design was chosen as it allowed for new questions emerging during the interview to be added.

4.2.3 Data analysis

The collected data was considered and analysed based on Suchman's situated action, which was previously presented in Chapter 3. What actually was observed taking place in Dspace was considered in relation –and often in contrast– with the plans for its anticipated use as this was reported or envisioned by managers and designers of the space. However, the analytic approach allowed also for potential other themes that emerged to be considered as expressions of the situated action that took place independently of the desired or planned action. The outcomes of the analysis are presented as themes of actual use in section 4.4. and later on discussed with regards to the envisioned usage of the space, issues of situated action and related literature (section 4.5).

4.2.4 Participants

For the observation there was no predefined group of participants; since the space was public and located within the university library building, anyone that entered the space automatically became an observee. However it was more often that the people who entered Dspace were members of the university (students, academic staff) rather than general public as a keycard was required to enter the space. It was also observed that the majority among them consisted of members of the

library staff. Overall, at any given time no more than four people were observed using Dspace.

For the semi-structured interviews, three groups were identified and interviewed for their capacity to shed light to the research questions at hand. Those were the managers of the space, the core users and first-time users. In total, 8 people were interviewed: one manager, one core user and six time first users.

4.2.5 Ethical considerations

Dspace was a public space in a university library building of which the researcher was a member and therefore had access to. The managers of the space were informed about the study; regarding the users of the space, it was not feasible to acquire informed consent of each one individually as there was no predefined group and the researcher had no control over who entered the space⁹. Hence, ethical concerns were addressed during the observations in the following way:

1. the researcher ensured that there were no circumstances that could harm the participants,
2. the observation protocol followed was the same as it would be in any public setting i.e. in a street, a square, or public event, and
3. users' interactions were only recorded via hand-written fieldnotes. No photos¹⁰ or any other recording were taken while people were using the space.

⁹ In retrospect, the same approach that was later followed for Cspace – that of posting the information sheet of the study on the walls and entrance of the space – could have been applied in Dspace too. Given Dspace was the first setting observed, the researcher was not fully aware of such alternatives.

¹⁰ Any photos of people provided in Chapter 4 are reconstructions.

Where semi-structured interviews were conducted, participants were informed about the purpose of the study and were given the option to withdraw at any point. On withdrawal any data related to them would be deleted and would not be included in the analysis.

4.3 The setting

4.3.1 Setting description

A detailed description of Dspace as observed during the period of the study is provided in this section. Further reasoning for some of the choices behind its design is provided in the next section along with the statements for its anticipated use.

Dspace was an innovative learning space situated on the ground floor of a university's library building. It was a public, non-bookable space, situated at the far end from the main library entrance. Its door was the first in a line of office doors and required a key card in order to gain access. In terms of size, it was a medium size room. From the outside, the view into the space was obscured by walls and a one-way window. There were, however, a few small port-hole windows that allowed partial view inside Dspace. At the time of the study, Dspace had been open for approximately 15 months. Its presence and availability was strongly promoted around the university.

In the interior, the room comprised of a variety of seating arrangement: a big U-shaped couch with movable sections, bean bags, desk chairs, armchairs and coffee tables with wheels (see Figure 4.1). State of the art technology was also added to the space, including a large collection of current video games and their consoles (Nintendo Wii, Xbox360, Sony PS3, PSP, Nintendo Ds). Other technological equipment chosen to support or enhance the gaming experience included a LCD screen, a digital home theatre speaker system, a projector and a large projector screen mounted next to the game consoles. All of the above were controlled (as input and output sources) via a small touch screen (see Figure 4.2)

positioned near the window and far from the actual devices. The actual controls of the devices were either disabled on the device or integrated via their cabling into the touch screen interface. As the manager explained the reason behind this integration of all the controls was decided due to a number of incidents where people fiddled with the actual cables of the devices in an effort to add their own devices or appropriate features of the existing infrastructure. Re-instating what had been tampered every time took time and it was dangerous for health and safety reasons if anyone had access to the cabling. As a result all the cables ran through a cupboard – locked for additional safety – and straight from there were connected with the touch screen interface.

A selection of portable smartphones, PDAs, iPods and Nabaztag rabbits were also placed in the area. Most of the technology was positioned and displayed on shelves – and in some occasions labelled (see Figure 4.2).

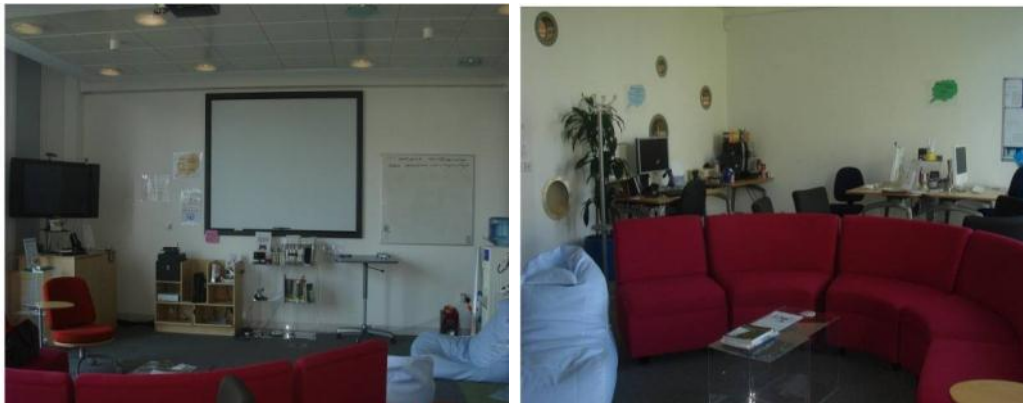


Figure 4.1. Two views of Dspace, showing the placement of technology and furniture against the walls and the small porthole windows that provided the only view into Dspace

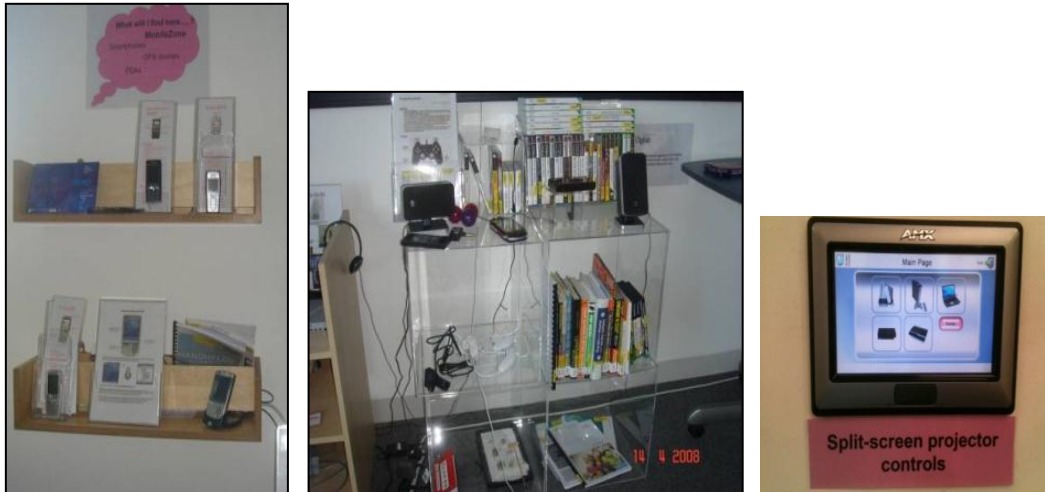


Figure 4.2. On the left and middle, smartphones, games, handheld game consoles and books displayed on the shelves in Dspace; and on the right the touch screen that controlled the LCD screen and projector screen as well as input sources to those (laptop, game consoles etc).

Three workstations were also placed in Dspace. Two of the workstations were Macs and were the only ones on campus at the time where access to the online virtual world Second Life was available¹¹. The other workstation was a PC and was set up to be used as a podcasting station. A coffee machine that served free¹² coffee and other hot beverages – users could contribute at their discretion – was also available in Dspace. An assortment of books and magazines on education and technology were spread around the room. A number of low-tech artefacts, intended to be used for brainstorming and prototyping, were placed in Dspace e.g. Lego, plasticine, colour crayons and bendy sticks.

¹¹ According to the managers access to Second life was blocked everywhere else in campus due to the university's firewall.

¹² In the Library building there was another area where coffee could be acquired. It consisted of tables and served as a place where people could have their lunch or coffee breaks since food and beverage consumption was not allowed in most other parts of the library. However, the coffee in that area was from an automated vending machine –whether in Dspace it was a barrista coffee machine – and people had to pay for it.

At a closer look it was also noticeable that Dspace had been split into zones, the Games Zone, the Mobile Zone, the Mac Zone, the Podcasting Zone to make different types of educational technology easier to find in the room. On the walls, and adjacent to each of the zones, there were labels and print-outs with brief introductions to each technology, instructions and links to further resources about the technology at hand (see Figure 4.3).

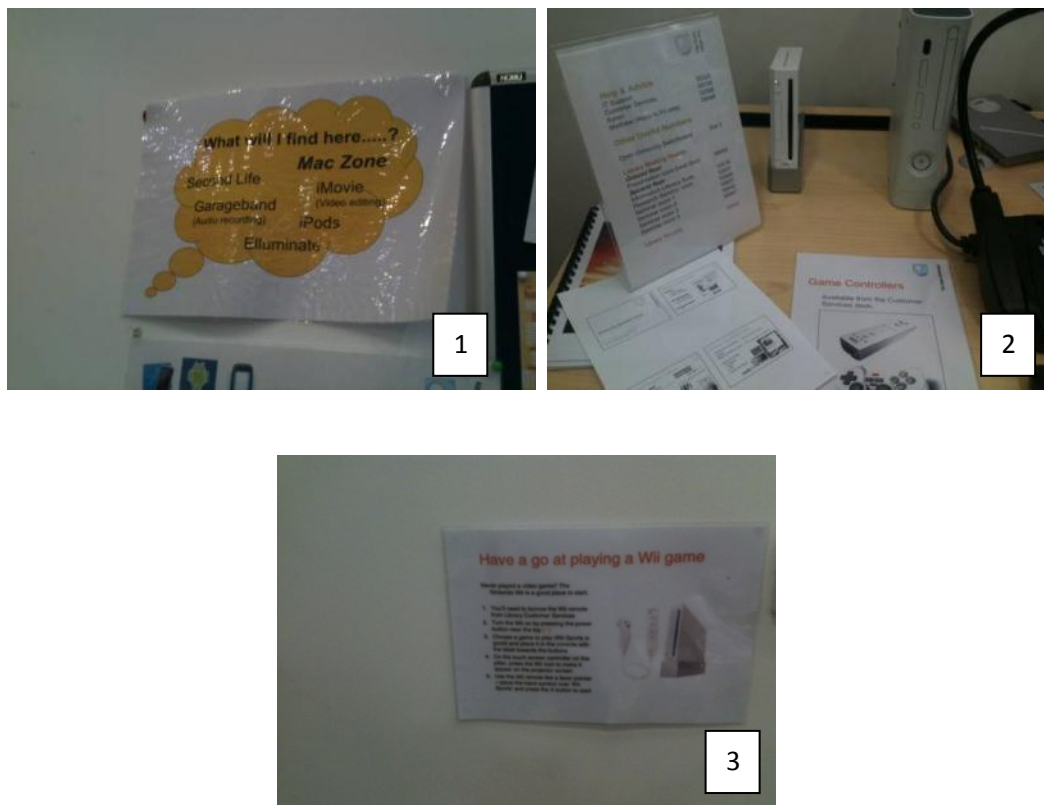


Figure 4.3. Affordances and resources provided with technology: (1) printouts that indicated the zones in the room; (2) manuals and printouts with instructions next to the game consoles and; (3) instructions posted on the wall

4.3.2 Anticipated use

Dspace, similarly to other innovative learning spaces, was designed with the purpose to support various activities taking place often simultaneously. Quoting the managers of Dspace and the relevant documentation collected during the

study, those various activities can be arranged in three broad aims that Dspace was designed for. Dspace aimed to:

i) *“be a creative play area to experiment with and explore new ideas and share knowledge”*;

ii) *“bring together new technologies and ideas on how they could be used for learning and teaching now or in the future”*;

iii) *“bring together academics with common interests and ignite future work opportunities and collaborations”*.

Regarding the first aim, further commentary from the managers clarified how it was envisioned that Dspace was a drop-in space where all visitors of the library can have access; that would allow for brainstorming by means of low and high tech material. In this respect, Dspace was strictly a non-bookable, public space and a number of low tech props could be found scattered around the space such as Lego, plasticine, colour crayons and bendy sticks. The benefit of this was seen as supporting both the second and third aim as well as the development of pedagogically innovative and effective learning materials.

Regarding the second aim, the designers and managers of Dspace wished to provide users of Dspace – and in particular the *technophobic academics*¹³ – with the

¹³ As the manager explained in her interview, the main target user group of Dspace was identified as the *technophobic academic*: *“when we started doing some user consultation, before we started building Dspace, we went and spoke to quite a few people around the campus and found that our core audience were likely to be people who don’t ordinarily use these technologies in their everyday life. The early adopters – people who can play with these things anyway – they weren’t really interested, they couldn’t see the point, coming out of their offices to another place to play. So we realised very early on that really our core audience are the people who are perhaps a little bit technophobic or who simply haven’t had the opportunity to try out some of these things even though they have seen their kids using them or heard their colleagues talking about them (...)*.

opportunity to trial emerging commercial technologies such as gaming consoles, smart phones and e-book readers. It was considered that potentially such technologies would not be readily available for everyone to use in their everyday life and Dspace would provide the chance for people to get acquainted with them and further inspire further incorporation of those technologies into the development of educational material and activities. For this purpose, state of the art technology was introduced and regularly updated in Dspace, including a large collection of current video games and their consoles (Nintendo Wii, Xbox360, Sony PS3, PSP, Nintendo Ds), a selection of portable smartphones, PDAs, iPods and Nabaztag rabbits. Other technological equipment chosen to support or enhance the gaming experience included a LCD screen, a digital home theatre speaker system, a projector and a large projector screen mounted next to the game consoles.

Apart from being a space where academic staff could familiarise themselves with new technologies, it was also hoped that Dspace's comfortable layout and informal atmosphere would bring together academics with common interests and ignite future work opportunities and collaborations. The library was chosen for that purpose as common ground between all the departments and disciplines. As the manager pointed out, they had put a lot of thought and effort to make Dspace approachable to everyone on campus: *"(...)There is also the CETL (another technology-rich space in the campus) but the idea was to have a space that can be approached and owned by people from all the departments. Library was neutral that is why it was chosen. If Dspace happened in a department people would feel strange, like invading in others' offices."*

Comfortable and flexible furniture was chosen for Dspace to help visitors relax and also to allow for a variety of seating arrangements; comprising a big U-

shaped couch with movable parts, bean bags, desk chairs, armchairs and coffee tables with wheels (see Figure 4.1). A coffee machine that served free¹⁴ coffee and other hot beverages – users could contribute at their discretion – was also available in Dspace to accommodate for a relaxed atmosphere.

¹⁴ In the Library building there was another area where coffee could be acquired. It consisted of tables and served as a place where people could have their lunch or coffee breaks since food and beverage consumption was not allowed in most other parts of the library. However, the coffee in that area was from an automated vending machine –whether in Dspace it was a barrista coffee machine – and people had to pay for it.

4.4 Actual use

The data was analysed in terms of comparing expectations and actual use. The interviews and observations showed that Dspace was used differently from how it had been anticipated by the managers. A main finding was that Dspace was very often empty. Second, its purpose of use/identity was confusing to the users, which mainly translated to them appropriating the space according to their needs and assumptions. In this respect, Dspace, was used primarily as a meeting space and secondarily as a break room. Play and waiting room were less frequent uses of Dspace.

Further, it was rare that more than one group used the space at any given time. What is more, it was implicitly or explicitly treated as a private space rather than a public one. Third, very little of the available technology was played with.

4.4.1 A confusing space

For the most part, people were confused as to what Dspace was or what they could do in it. Conversations between first-time visitors of the space illustrate their puzzlement. For example, two people opened Dspace's door and peeked into the room. One asked the other: "*What is this place?*" When the other person said he didn't know, the first one turned to the researcher who was sitting next to the door and asked the same. After a short description was provided, she replied: "*Oh cool! I wasn't sure... thought maybe a fancy study room or something*". The same confusion was also apparent in the responses of the first time users when asked to give a one-word description for Dspace. Three of them responded "*meeting room*", two of them "*play space*" and one of them "*mixed lounge room*". A more careful look at the data suggests that their answers were guided from what was happening in the space when they first visited it. The newcomers that happened to enter Dspace

when there was an informal meeting in progress responded with “*meeting room*”. Those who visited Dspace when it was empty found it harder to provide a characterisation for the space – the first response for two out of three was “*I don’t know*” – and after having a look around decided on the “*play space*” or “*mixed lounge room*” and one insisted that he didn’t know.

During the time of the study, a primary use of the space turned out to be as a meeting room for formal or informal gatherings. Below we describe how this occurred.

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/or work related subjects while having coffee. In fewer occasions, individuals were using the workstations in Dspace for teleconferencing with work partners. Further, in two occasions, an interview took place in Dspace; in the first, two people were interviewing a candidate for a library job vacancy and in the second a member of the library staff was being interviewed about the services and facilities available. Similarly, regular users of Dspace used it to hold various meetings, such as supervisions, project and planning meetings. Although the regular users knew that the space was meant to be for experimenting with new technology and considering relations with educational contexts they chose not to use it in this way. They reported using it differently. For example, one of Dspace’s regular users described her everyday activity in the space: “*Usually I am 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 (...) I have never used any of the game consoles... I am not interested [long pause] I guess I was never a gamer*”.

Casual conversations with other regular users revealed a similar pattern of use; they usually used Dspace for their informal meetings and hadn't played with any of the 'games' in the room although "*they liked having them around*".

Apart from people having formal or informal meetings, a variety of other uses were observed. People were often seen reading books or magazines while enjoying a cup of coffee. Others were seen using the workstations either to check emails, browse websites or podcast. Others visited Dspace to have lunch. On a few occasions, especially later in the afternoon, people came to Dspace to 'kill' time while their bus or other transportation arrived. On these occasions, people sat next to the window or paced around the room while looking through the window to see if the bus had arrived.

In the two cases that Dspace was observed as being used as a play space, the play was not experimental e.g. when two or three students were playing with the Wii console during or after their lunch break, they were familiar with the Wii. In a few occasions that some form of play (e.g. gaming consoles) was attempted, it was observed that there were deterrents. For instance, people came into Dspace with the intention of playing but were deterred by an informal meeting or some other activity that was already in progress or they couldn't figure out how to use the technology involved. Section 4.4.3 provides a lengthier description of this instance.

4.4.2 A private space

During the time of the study, Dspace was rarely used by more than one group or two individuals at any given time. Once one person or a group was using it, others either were not comfortable using it or chose not to use it.

A common everyday activity in Dspace was either of individuals having their break or small groups of people using the space for their informal meetings. There were very few occasions where people who did not know each other co-existed in the room; in most cases it involved the space being shared between two individuals or one person and one small group of people. In these situations, one of the two parties was engaged in a quiet task such as reading or browsing online and the other was either doing something similar or discussing with each other.

In general, people were observed avoiding co-existence with other people, whenever possible. There were several occasions when people left the space because someone else was already there. For example, on one occasion two people were in Dspace having a rather formal meeting¹⁵. Fifteen minutes into the meeting, the door opened and two more people entered Dspace chatting loudly. The group already sitting there turned and looked at the newcomers; automatically they lowered their voices, whispered something to each other, turned and left Dspace. On a similar occasion, a group of three people entered Dspace. In the room there were already two more people, one reading and one browsing at one of the workstations. The group whispered to one another for a couple of minutes, as if they were deciding what to do, and left Dspace.

There were also several occasions when people left and returned to Dspace after the first group had gone. Such an occasion has already been illustrated in the previous example about creating corners and whispering; C. and D. returned back to Dspace after the other group had left. In another very similar example, C. (one of Dspace's regular users) was in Dspace podcasting from one of the Mac

¹⁵ The nature of the meeting is characterised as formal based on the demeanour of the two participants; their tone, verbal exchange, posture and physical distance between them all indicated that it was a rather formal work-related meeting.

workstations. While fifteen minutes into the podcasting D. and E. entered the room. They glanced at C. and sat on the far edge of the couch chatting. C. (who was still podcasting) coughed and stared at them. D. and E. immediately lowered their voices but continued chatting in a whispering voice. At that point C. talked to his podcast audience (it was his turn) and D. and E. realised that C. was in the middle of a podcast. They whispered something to each other and left the room. C. continued podcasting for another 1.5 hours and then left. Five minutes after C. had left Dspace D. and E. returned and continued with their chat.

Even when people co-existed in Dspace their demeanour revealed it was not preferred. Facial expressions, annoyed looks, stares and body language were indicators that users often 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 that suggested an uncomfortable coexistence were observed: whispering and *creating corners*. Creating corners (see Figure 4.4) describes 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) with their posture or the movable furniture. Further, when individuals/groups co-existed in Dspace, they spoke in a low voice or whispered. One example from the fieldnotes showcases both these patterns: *“Am and Bf are having a meeting in Dspace; they are sitting on the left corner of the room, next to the window and adjacent to one of the Mac workstations. They are discussing at normal voice, occasionally loud. Cf and Df (Df is library staff) enter the room. They sit on the right edge of the couch. They seem to be starting an informal meeting. Am and Bf briefly interrupt their discussion until Cf and Df are settled. Am*

glances at Cf and Df; he looks annoyed. Bf continues talking to Am but this time in a much lower voice.

Cf and Df are whispering too and have cornered up in the very far edge of the couch. Am looks at Cf and Df again more persistently this time.

After ten minutes Df whispers something to Cf [inaudible] while glancing at the other group and then suggests they leave Dspace. Df and Cf gather their things and leave. After their leaving Dspace, Am and Bf continue their discussion in normal voice. They leave twenty minutes later. Two minutes after they left Cf and Df return to the space and get on with their meeting”.

The excerpts above illustrate how people who used Dspace both for work-related and non-work activities were often displeased by the presence of others.



Figure 4.4. *‘Creating corners’ in Dspace*

The manager in her interview explained how they had expected such conflicts to occur when deciding upon a non-booking, publicly available policy for Dspace, but happily reported that, in her opinion, they hadn’t occurred: *“it seems to be working really well and people don’t mind sharing the space with others”*. Nevertheless, the manager also mentioned how *“often”* they 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”.

Regular users of the space knew that Dspace is public and non-bookable and one of them also claimed that she enjoyed that: *“No, I find it stimulating; I don’t mind if there are other people there or them overhearing- I overhear sometimes (laughing)! 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”.* Still very rarely, regular users co-existed with others in Dspace. On most occasions, they left and returned in the room when it was not occupied.

For first-time users, it was different. All of them in their interviews– with the exception of one – identified Dspace as a private space. One of their main explanations for this characterisation was the key-card locked door. To their understanding *“a room that requires key-card access is not public, even if it is in the library”.* In addition, when told that Dspace was a public room, all of them were confused and sceptical: *“(…) 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 and activities”.* Two of them also pointed out how if they entered Dspace 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.

4.4.3 Minimal use of familiar technological devices

Regular use of any of the technology in Dspace was minimal. Further, on the occasions when it was used, it involved people using technological devices they were already familiar with to accomplish everyday routine tasks, such as emailing, web browsing, etc.

As described previously, people mainly used Dspace for informal meetings. During these meetings, they were either discussing with each other or using paper artefacts to support their meeting. Only on two occasions was it observed that people used the technology in the room instead of pen and paper to support their informal meetings. In these, one person in the group used one of the Mac workstations to present a slideshow presentation to the rest of the group. The group (three people) formed a half circle in front of the monitor to watch the presentation and kept the same formation while making comments on it/until the end of the meeting.

Other uses of the technology were initiated by individual users and not in a group context. In these instances, individuals used the workstations (either PC or Macs) to check their emails or browse websites. For example, A. visited Dspace during her lunch break; she scanned the room, then sat at the PC workstation and turned the computer on. While waiting for the computer to turn on she began to eat her lunch and when the computer was on, she logged in and then started checking her emails and responding to them. She continued with this activity until her lunch was finished, then made herself a coffee and left the room. In a similar example, D. was sitting in front of one of the Mac workstations; he was browsing some news websites as well as some popular technology blogs. After 10 minutes D. walked towards the coffee machine, made coffee and returned back to his browsing activity. After finishing his coffee, D. turned off the machine and left the room.

Less frequently (five occasions among the overall observed usage of Dspace) people entered Dspace with the intention to play with the technology provided. In the majority of these occasions, people while enthusiastic about trying out new games and technologies, did not manage to interact with the technology

successfully. They tried but couldn't get it working and left; or after trying for some time ended up asking for help. For example, on one occasion a group of three students¹⁶ people entered Dspace. They were cheerful and sounded excited about being in Dspace. One student said to the other *"I can't believe there is such a place on campus (big smile)!"* The other responded *"I wouldn't know about it either (inaudible but possibly was: I found out about it at) the induction"*.

They moved around Dspace, checking out what consoles and games were available. One of them walked towards the Mac workstations and grabbed an iPod. Another member of the group joined her as she tried to get the iPod working: *"Let me see maybe I can help, I have an older model at home... (continues fiddling with it) nah it is dead! Sorry...Do you think we can access Second Life here (points to the Mac)? I'll give it a try"*. He turned on the Mac and the third member of the group joined them. They all fiddled and tried different solutions to access Second Life; after five minutes of trying, two of the group gave up. Their attention shifted to the Nabaztag rabbit and they both got very excited: *"Wow! I love this! Isn't it the cutest? (the other smiles and agrees). You know, you can program it to do almost anything, notify about emails, weather, news (...)"* They chatted for a few minutes on the usages of the Nabaztag and what other trivia they knew about it while trying to get it to work. They pushed every possible button, checked the instructions but the only thing they managed to do was to make the rabbit flash. In the meantime, the student that was trying to access Second Life gave up trying and suggested they try playing some game: *"Let's try and play PS2!"* One of the other two replies: *"No let's play the Wii, they have more games for the Wii"*. They turned the Wii console on, chose a game, put the game in and were excited but they still

¹⁶ The student status was assumed by the content of the individuals' conversations while in the space.

had to figure out how to turn the projector on. They looked around but there was no obvious control for the projector. One of them suggested they used the LCD screen; they turned on the LCD only to realise that the Wii was not connected to that screen. All the cables of the Wii were tied together and connected to the projector. Two of them kept reading the manuals while the other one inspected the infrastructure. After a while they managed to find the controls for the projector camouflaged in a tiny interactive screen on the wall. They went back to the instructions but they still couldn't make it work: *"it doesn't make sense...I am doing as it says yet nothing happens (sigh)"*. *"Let's call the manager for help!"* The other two were sceptical about calling the manager. One of them said it might take long for the manager to get there. The other one expressed disbelief about the manager being able to help. Ten minutes later, they all agree it was time to call for help. While waiting for the manager, one said to the other two: *"This is too much effort, I don't feel like playing anymore..."* and another agreed: *"I know...I hope they fix it soon otherwise we should go. I have to leave soon anyway"*.

The controls for the projector were in the form of a touch screen, as explained earlier that was not positioned near the vicinity of the screen (see Figure 4.5). Therefore, a first obstacle to overcome was finding the control panel and quite a few visitors did not manage to go further than that.



Figure 4.5. On the left picture, the control panel for the projector and on the right, it is shown the position of the panel within Dspace; the white arrow points at the control panel and the black shows where the projector screen is.

During casual conversations with other users of Dspace, similar examples were reported; visitors had difficulties in making simple things work, such as getting the projector running, and reported feeling incompetent using the technology in Dspace even when it was for applications that they had used before at home or elsewhere (e.g. Wii console or the iPods). Despite their previous experience, they were not able to work out how to use the same technology in Dspace. Furthermore, it was noticed that the people who had entered enthusiastically, to play with the technology, such as the gaming consoles, were mostly students who wanted to spend some recreational time during their break or after hours.

Observations and conversations with several of them also revealed that a number of them were intimidated and afraid of engaging with the technology inside Dspace. This was more frequent with visitors who were recently introduced to the space. For example, the following conversation was overheard between two people looking at the technology in Dspace. While this conversation took place, A. and B. were just browsing the space. None of them tried or touched any of the technology around Dspace:

A: *“They have very interesting things around here. Look at these phones... they look so fancy and bulky...”*

B: *“Yes, they are almost like computers these days...”*

A: *“Do you think we can try them?”*

B: *“I am not sure...I am worried I will break them or something...”*

A: *“(nods like she agrees) I guess you are right...they look quite delicate”*

B: *“If you want to try, you can. They said so when they showed us around the other day...”*

A: *“Maybe another time.”*

One of the managers of Dspace corroborated these remarks: *“(...) 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.”*

4.5 Discussion

In the previous three sections that describe Dspace's actual use during the study, it has been evident that its current use was somewhat distinct/different from what it was envisaged (in its inception) by the managers and designers of the space. In the following sections, we elaborate more on this tension between actual and anticipated use and suggest some potential reasons for this. Two notions are further considered in relation to our findings that of appropriation and of facilitation. Links are made both with the main theoretical approach of this work (situated action) as well as with other relevant literature from studies of ubiquitous computing in the wild. In the last section of the discussion (4.5.3) the findings of this work are considered in relation to the research questions.

4.5.1 Actual versus anticipated use

Dspace was created and accordingly designed¹⁷ in such a way in order to support three main aims. It was intended to be a space where people would come to:

- i) explore new ideas and knowledge regarding teaching and learning in an informal playful manner;
- ii) try out new technologies;
- iii) and serendipitously meet others with common interests and consider new collaborations.

Yet the findings from this study revealed that Dspace's everyday reality and usage was different to what it was envisioned. Dspace was shown to be used primarily as a meeting space or a breakout room where no playful exploration of

¹⁷ By 'designed' we refer to the choices of spatial layout, furniture and technological equipment/infrastructure made by its designers and managers.

ideas with low tech artefacts (Lego, bendy sticks) nor any obvious experimentation with new digital technologies (gaming consoles, smart phones) took place. This was a disappointment to the managers who had hoped for more people to try out the technologies to see what possibilities they might offer for them to use in their teaching and research. Some of the technology in the space was used, even though rarely, but its usage reflected the repurposing of the space as a meeting room or a break room. Digital technologies such as PC desktops, the projector, the LCD screen were used to discuss work, to present slide presentations, or contact partners through teleconferencing, to check emails, to browse online content while having lunch.

Further, as far as accommodating for serendipitous acquaintances and collaborations were concerned, to achieve those, other issues needed to be tackled first. The space being perceived as not publicly accessible, the way people created corners even in round and open-ended spots within the space suggested an uncomfortable coexistence of two or more parties. Such awkwardness did not lend itself to spontaneous acquaintances and collaboration. Before supporting work-related serendipity, Dspace had to accommodate for *comfortable social co-existence*. So why was Dspace appropriated as a private space? Why were people uncomfortable sharing Dspace?

In many ways it occurred that Dspace was being used accordingly to its very initial conception: as a space where people went to comfortably read journals and have coffee. It was that initial wish or potentially requirement from part of academic and library staff of having a comfortable place to read books or journals

that had sparked Dspace being conceived in the first place.¹⁸ As one of Dspace's managers had explained in the interview: *"because a lot of the graphic design journals are very image heavy, we couldn't get a hold of them electronically like we do with most of our journals, so C. said it would be really nice if there was a comfortable space in the library, where they could come to read these articles"*. The idea of having such a space soon evolved into creating an innovative learning space: *"the idea kind of ballooned from there...from having a few comfy chairs and the current periodicals collection to having this creative play space with examples of technologies that could have educational application so that people could come and get hands on with them and have a play and just get familiar with them ..."*.

It could be that the misalignment between actual and desired use was in reality the reflection of a misplaced/misread need. Potentially, a space for creative brainstorming and experimenting with technologies was not recognised by perspective users as something that was required, at least not immediately.

Other reasons that can potentially account for the tensions found between actual and anticipated use include issues around its location and physical layout. From the outside, the locked door, the walls, the portholes, the one-way window, all can be claimed that they contributed to assigning a *private effect* to Dspace. As shown the majority of the first time users perceived Dspace as private and attributed that to the above features. Similarly, most of the technology was positioned and displayed on shelves (see Figure 4.2) which might account for why people were intimidated or occasionally unsure as to whether they could use the

¹⁸ As much as it sounds strange that a library was lacking a space for people to read, the space that regulars had in mind was different to the study/reading spaces available at the time. The library was full of desks and chairs where people could sit and read or work but the new space would offer the alternative of having something like a living room, a place where you could sit on an armchair or a couch and enjoy your coffee and/or food while reading.

technology in Dspace. It is quite possible that visitors to the space thought that these items were only on display and not available for use and interaction. In particular, if one considers that Dspace was located in the library building it is even more likely that people's assumptions regarding the use of these technologies included having to borrow them through the front desk. Architectural space can constrain or enhance intended use and/or social interaction via its merely spatial features (open/closed areas, windows, doors etc) but mostly via the social assumptions that it bears. These can often be ignored or neglected because we habitually take space arrangements for granted. As Strange and Banning (2002) asserted "*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*". In the case of Dspace though, more constraints seemed to be in place. A conversation with one of the managers revealed that she also was not happy with the technology being placed on the shelves. She had actually initially (when Dspace first opened) placed them next to the couch and around the space within reach. This placing though was not approved by one of her superiors who asked for the shelves to be created so that the devices can be placed there "*neatly*".

The location of Dspace within the library building might have made it awkward for people to feel at ease playing computer games altogether due the etiquette assigned to the library institution. People are not used to playing games in a library. On the contrary, the social institution of a library is most often associated with endeavours of long-term silence and behaviours of hard work, e.g. reading either individually or in groups. This perception of what a library is for has been changing slowly in the last few years and innovative learning spaces are very much a part of this transformation. It is quite possible that the new paradigm for

younger generations would be that of a high tech library with virtual books and interactive playful devices. For now though this transformation is undergoing and people's associations seem to be still deeply rooted in the old library paradigm.

A major issue for Dspace was found to be the confusion concerning its identity and use in particular when existing activity and appropriation was absent. First time users were unsure both as to what Dspace was and also as to their role in it; what they were allowed to do or not. As suggested the location of Dspace might have been to some extent contributing to this confusion.

Yet another consideration regarding this might be found relating to the variety of activities Dspace was expected to host. On the one hand, it provided many visual cues of what was on offer that could be tempting to have a look at. On the other hand, it may not have offered enough clues or a clear direction about its usage, making it difficult to know how to behave. Dspace was full of cues and clues but which appeared to be counter-productive; as astutely observed by one the interviewees: *"it is schizophrenic, not sure what it is"*. It might be the case that technology-rich learning spaces that are designed with one specific purpose in mind 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). Moreover, the confusing or unfamiliar setting might have led to people using more familiar – less experimental – technological devices. Being in a space that was unfamiliar – in the sense that it wasn't their office or home – the use of technology that was *new*¹⁹ to them was probably not their first choice.

¹⁹ It might be argued that a projector or an LCD screen is not new technology. However, how these were setup and controlled within Dspace was unknown to visitors, as shown earlier in this chapter, and required *new* knowledge for them to use them.

Further, being a relatively small space, the coexistence of more than one group engaging with a certain activity became quite challenging. For example, it was difficult to have a group of three-four people playing a game on the Wii console while at the same time another group had a meeting. Both the seating was not adequate for such a co-existence but also the noise levels of one or the other group made it hard for any of the two interactions to be experienced – or enjoyed – in the way intended. In addition, the way regular visitors used the space might also have set an example to others, suggesting how it should be used. People establish behavioural routines, according to the space they are in and depending on the existence/absence of other people. Once Dspace was perceived and used as a meeting room or a rather private space, it became very hard to reverse.

4.5.2 Appropriation and facilitation

Considering the tensions revealed between Dspace's actual and anticipated use, two broader issues appear relevant, that of appropriation and that of facilitation. In Dspace, people used the space differently than what it was intended, or as we have said earlier in this chapter they appropriated its use for their own needs and purposes. Appropriation was found to be significant in this study as it reflected to some extent the tension between actual and anticipated use. Seen strictly from the perspective of those tensions, appropriation was not a positive outcome for the use of Dspace. It meant that experimentation with technology that could have benefited students and members of staff did not take place; or it meant that potentially some people did not use Dspace as they thought that wasn't an option (private). Appropriation though can have a positive meaning and in the literature of Design and HCI it often does. For example, lately it is more common for appropriation to refer to the ways people extend the original use of the technology in an innovative

and playful way. Appropriation indicates creativity from the users' part and also suggests a sense of ownership. For users to reshape and/or adjust the original use of a technological artefact, it indicates that they were comfortable and/or familiar with the technology and also implies that they felt they had the right to do so (Dix, 2007).

In that sense, appropriation is considered a positive – occasionally even a desirable – outcome both by designers and researchers in HCI. As a result, there have been a number of studies that are interested in understanding how people appropriate. Some of these studies are concerned with identifying why people appropriate in the first place and what are the individual factors that affect these decisions (Carroll et al., 2002). Several investigate social aspects and organizational aspects of appropriation such as how work groups adopt and negotiate technologies through appropriation (Bansler et al., 2006, Dourish, 2003). A number of frameworks and guidelines have also been suggested in order to promote the 'design for appropriation' (Carroll et al., 2002; Dix, 2007). Seen from this perspective, Dspace's tensions reflect a number of underlying features that can encourage formal and informal learning which is a main aim of innovative learning spaces in general. Dspace's appropriation suggests a community of regular users that were comfortable enough to do what they wanted in the space regardless of what it was intended for. This sense of comfort together with the sense of community could provide the basis for a re-alignment between actual and anticipated use provided some extra or different kind of facilitation.

As reviewed earlier in the literature (O'Hara, 2008; Brignull and Rogers, 2003), facilitators have often been found useful in supporting or directing users towards desired use of a technology. Facilitation can take many forms, and to some

degree versions of facilitation were attempted in Dspace. Its anticipated use was advertised through the university's paper as well as through the official website, postcards and leaflets. Further there were leaflets and instructions next to each of the technology as well as clear instruction that people could refer to the main desk or call a specific number if they required help. However, as shown those did not prove very helpful in indicating or supporting Dspace's aims. A different kind of facilitation is necessary in order to regulate the exhibited appropriation and balance the multiple stakeholders (administration, managers, users). Considering the comperes in O'Hara et al. (2008) or in Brignull and Rogers (2003), it might be that a more hands on approach could have benefit Dspace. This particular consideration of how some different, potentially more active, facilitation might be required was discussed between the researcher and the manager of the space as part of the feedback provided after the study. The manager confirmed this concern, and as a later follow up a number of mini-workshops were organised regularly where the managers would show small groups of people around Dspace or help them familiarise with specific technologies that they might wish to try.

4.5.3 Summary of outcomes

The study presented in this chapter reports on the everyday use of Dspace, an innovative learning environment located in the library building of a university campus, as this was observed and experienced by the researcher and talked about by its users. The descriptions of Dspace's everyday use answer the question of what takes place in this innovative learning space at an everyday context. Together with the descriptions from the other two studies, they provide an answer to the first research question (How do people interact with the architectural and

technological infrastructure and each other in innovative learning spaces on an everyday basis?).

Further, the discussion of this chapter contrasts the everyday use of Dspace with what was envisioned and anticipated by its managers and answers in part the second research question (How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?). Dspace's actual use was different to what it was anticipated by its designers and managers. Instead of being used as a space of serendipity and experimentation with novel technologies, Dspace was shown to be used primarily as a meeting space or a breakout room where playfulness was very rare. The discussion in this chapter also begins to account for the potential reasons of this tension between actual and anticipated use, as part of a framework that will satisfy research question 3 (How do we account for the differences between actual and anticipated use of the spaces?). More specifically, issues relating to the location of Dspace (library) and its social etiquette seemed relevant to the confusion and difference in use. Equally, how technological devices in the space were laid out and the available guidance for their use were found to contribute to the above.

Two broader issues also emerged in the discussion of the findings: appropriation and facilitation. Considering how users appropriated Dspace and potential reasons behind these appropriations can account for the tensions observed and set the foundations for re-aligning actual and anticipated use. With respect to facilitation, it is suggested that Dspace needed a different kind of facilitation model similar to the ones suggested in earlier literature (O'Hara, 2008; Brignull and Rogers, 2003). Both these key concepts (facilitation and appropriation) are elaborated later in the Discussion Chapter.

Chapter 5

Qspace

Contents

5.1	Introduction	111
5.2	The study	113
5.2.1	Choice of setting	113
5.2.2	Data collection	113
5.2.3	Data analysis	114
5.2.4	Participants	114
5.2.5	Ethical considerations	115
5.3	The setting	116
5.3.1	Setting description	116
5.3.2	Anticipated use	120
5.4	Event 1: Workshop on Shareable Interfaces for Learning	123
5.4.1	Description of the setting for the workshop event	123
5.4.2	Actual Use	126

5.5	Event 2: The Scrapbook event	140
5.5.1	Description of the setting for the Scrapbook event	140
5.5.2	Actual Use	142
5.6	Discussion	149
5.6.1	Actual versus anticipated use	149
5.6.2	An unconventional space	152
5.6.3	Facilitating an unconventional space	155
5.6.4	Further reflections on the facilitation of Qspace	157
5.6.5	Summary of outcomes	160

5.1 Introduction

In the previous chapter, the analysis revealed a set of tensions between anticipated and actual use. Dspace – potentially due to its location and the social norms relating to it – was appropriated more as a private meeting room rather than an experimental play space. Although a drop in space, Dspace ended up being *privatised* by the everyday practices that took place in it. In some ways, Dspace's multi-purposeness made it too open and this was found to create confusion that inhibited its intended use.

In this chapter we report on the investigation of our second setting, Qspace. Qspace's spatial layout was minimalist with white surfaces, sparse furnishing and the technological infrastructure embedded in the physical layout. Qspace's managers had purposefully designed it this way to support and inspire creativity in teaching and learning. Their rationale was that this kind of design would facilitate creativity for a wide variety of activities and events.

Unlike Dspace, Qspace was open only when an event took place. Due to this, observations did not take place continuously over time, instead they were limited to the times an event was taking place. Two events were studied, an academic workshop and a community exhibition event called the Scrapbook event. Three parties were identified as being involved in the setup and use of Qspace: the managers of Qspace, the event owners and the event participants.

Due to the two separate events observed, Chapter 5 is structured slightly different to the previous study chapter. As in Chapter 4, we present the specifics of the two studies in section 5.2. Section 5.3 presents a description of the setting when no event took place and its anticipated use. Section 5.4 presents a description of the setting for the first event studied (the workshop), reports what took place on

the planning sessions of this event and what took place during the event. Section 5.5 presents a description of the setting for the second event (Scrapbook) and reports on what took place during this event. Finally, section 5.6 contrasts the observed actual use of the two events to the space's anticipated use and discusses emergent themes with respect to the literature.

5.2 The study

5.2.1 Choice of setting

Qspace was an innovative learning space primarily designed to support creativity in teaching and learning. Again there was some serendipity involved but mainly Qspace was chosen as the next setting to study due to its highly reconfigurable layout and the fact that it was facilitated. The initial outcomes from the analysis of the previous setting were indicating that the Dspace was used differently to what it was anticipated, that the technology in the space was rarely used and that users were confused as to the purposes of the space. Issues with the location/layout of the space and the provided kind of facilitation seemed associated to the above findings. Based on this, the researcher chose the next setting (Qspace) to be different in those two perspectives (facilitation, location/layout).

5.2.2 Data collection

Two events that took place in Qspace were studied for the purposes of this research. They were an academic workshop (involving participants from outside institutions) and a public event, the Scrapbook, that aimed to create and/or reinforce connections between the university and the local community. For the academic workshop, the researcher was a participant observer and also had access to the planning sessions that ran for three months before the event. The workshop took place in September 2008 (11-12th) and 'The Scrapbook' event in December 2008 (16-18th).

For the academic workshop, the researcher attended the planning sessions of the event, conducted a semi-structured interview with one of the managers of the space and observed and participated at the workshop itself. The data collected

were: fieldnotes from the observations, casual conversations and the interview with the manager, audio recordings from the planning sessions, photos and documents (email communications and brochures). For the Scrapbook event, there was no access to any of its planning sessions and participation and observations were limited to the day of the event. The collected data were fieldnotes, photos and documents (leaflets and brochures from the event).

5.2.3 Data analysis

The collected data was considered and analysed based on the approach of situated action, which was previously presented in Chapter 3. Similarly to the previous study what was observed actually taking place in Qspace was considered in relation –and often in contrast– with the plans for its anticipated usage as this was reported or envisioned by managers of the space. However, for Qspace due to the different nature of the events taking place in it, how people used it was considered both in terms of the aims and purposes of the event itself and also in terms of the broader aims/anticipated use of Qspace. The analytic approach allowed also for potential other themes that emerged to be considered as expressions of the situated action that took place independently of the desired or planned action. The outcomes of the analysis are presented later in this chapter as themes of actual use for each of the events studied and later on discussed with regards to the envisioned usage of the space, issues of context and related literature.

5.2.4 Participants

Qspace was studied in two events: the academic workshop and the Scrapbook event. The academic workshop was invitation only. Its participants, and in effect the study's participants, consisted of academics such as researchers and students (the event organisers were part of the academic community too) as well as the

managers of Qspace. The workshop attendees were approximately 30-35 people and in total during the two days maximum 50 people were present in the event.

The Scrapbook event was a public event and as such there was no predefined group of participants. The majority however consisted of students and academic staff as well as members of the represented community groups. On the day of the observation approximately 30-35 people visited the Scrapbook event.

Three different stakeholders were identified as being involved in the setup and use of Qspace: the managers of Qspace, the event owners and the event participants.

5.2.5 Ethical considerations

For Qspace, similarly to Dspace the managers of the space as well as the organisers of each event were informed both verbally and in written form about the study taking place as well as the purposes of the study and were given the chance to ask questions or withdraw their consent at any given time. Regarding the participants of the workshop, they were also informed about the study taking place both in the form of an announcement before the workshop began and also through individual information sheet and consent forms that were included in their workshop folders. Those were signed by the participants and collected by the researcher on the first day of the workshop. For the Scrapbook event, the circumstances were similar to that of Dspace: the researcher had no control over who would enter the space and it was not possible to disseminate informed consent forms to everyone in the space. To address this, the researcher took only fieldnotes of what took place in the space and whenever photos were taken, separate permission was granted after individuals were briefed on the purposes of the study.

5.3 The setting

5.3.1 Setting Description

Qspace was a Centre of Excellence in Teaching and Learning (CETL) that was created in 2007 as part of the Higher Education Funding Council for England (HEFCE) joint initiative. Qspace was an all-white minimalist space that could be spatially reconfigured through movable walls depending on the needs of an event (see Figure 5.1). It was located on the ground floor of the Engineering department building of a UK university campus. It was the only recently renovated space in a building that dated at least 15 years old and its location was relatively hard to be found by people who were not staff or students of the Engineering department. Because of this, whenever an event took place, the managers of Qspace or the event organisers had to ensure additional signage was put in place guiding people to the space from the two entrances of the building.

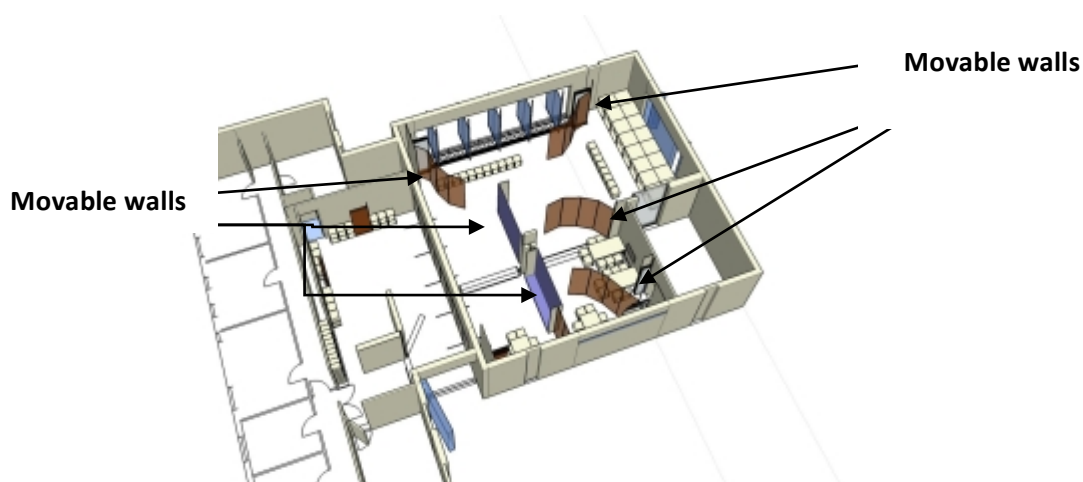


Figure 5.1. A 3D plan of Qspace showing its reconfigurable parts; movable walls are depicted in purple and brown

Its furniture was versatile and portable: it included chairs, stools, bean bags and tables stored in a separate area in the space that could be added – or not – in Qspace depending on the needs of the event. When no event was hosted, Qspace

had no furniture (see top left picture in figure below). White curtains run through the ceiling to enable creating smaller spaces and or be used as projection surfaces to create immersive environments. Immovable PLASMA screens hung on some walls and the space featured an integrated AV system. A number of projectors, and individually adjustable multi-coloured LED lighting were mounted on the ceiling. The projectors were set up to cover every possible flat surface in Qspace, again giving the possibility of creating visually immersive environments. The LED lights could be setup to change colour to convey different moods of the activity at hand. Similar to a blank canvas, Qspace could be 'painted' into anything its users needed and wished. Some examples of Qspace's potential transformations can be seen in Figure 5.2.

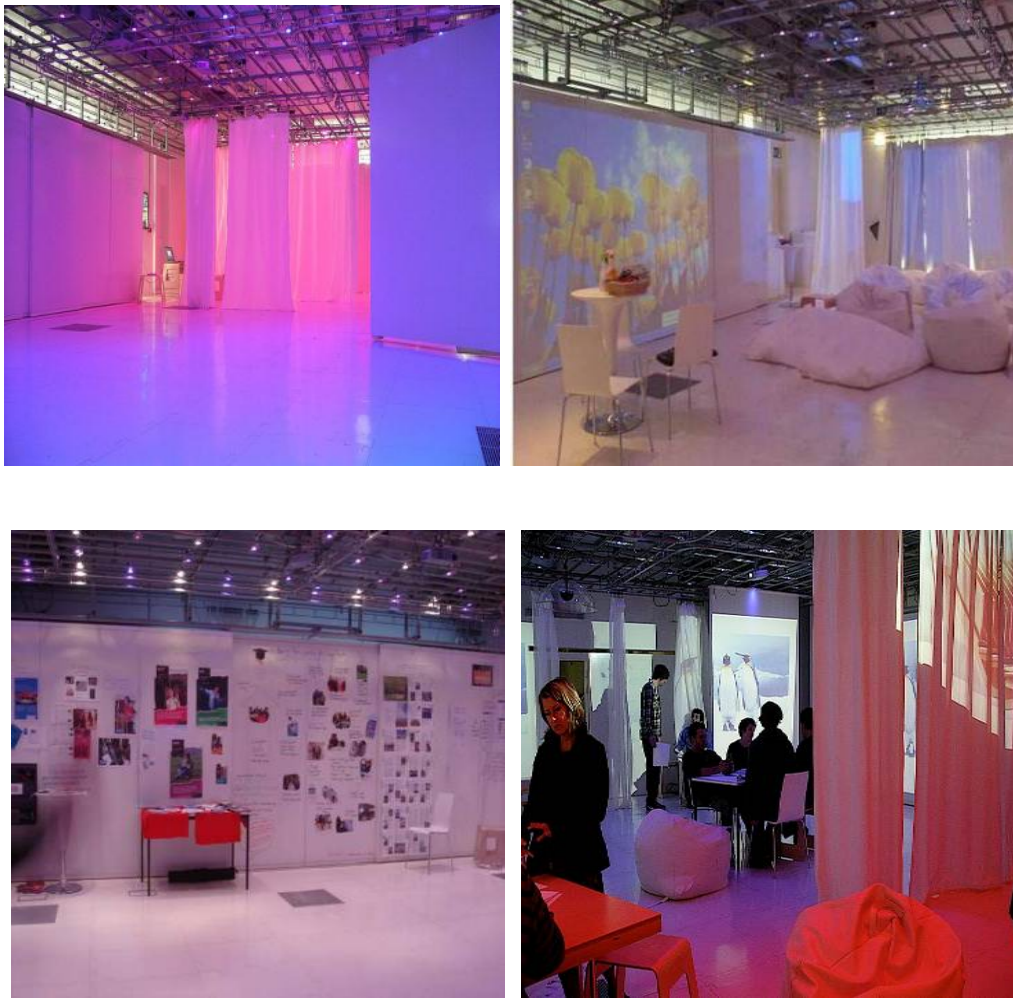


Figure 5.2. Different configurations of Qspace's main area for different events hosted

Its users were defined by the event hosted. So, for example, sometimes it was used by students and academics of the university; sometimes it was used by – and open to – the general public; and sometimes the nature of the event meant it was used by academics and researchers from outside institutions. Qspace's physical layout and technological infrastructure differed for each of the events. For the example for the academic workshop event, Qspace had to accommodate for a set of formal and sequential activities throughout its duration e.g. keynotes, breakout sessions, demo showcase etc. In contrast, the Scrapbook event was less structured and formal and where, different activities (e.g. presentations, browsing, adding information) could co-exist in the space without requiring any re-adjustment of

the spatial layout during the event. How Qspace was setup for each of the events studied is presented later in this chapter in more detail.

Due to health and safety regulations, separate training was required in order to be allowed to reconfigure the layout of Qspace. This meant that only a specific number of people were allowed to alter the Qspace's layout i.e. move the walls. Further, the AV system that was embedded in the space was not a commercial system – it was developed specifically for Qspace – and further its interface was password protected which again meant only a number of people were allowed to access it.

Every time, an event was considered to take place in Qspace, the managers had a lengthy process to ensure that the event was a good fit for the space and to arrange for the appropriate configuration of the space. They would meet with the event organisers well in advance, discuss the nature of the event and then suggest possible physical and technological configurations of Qspace based on the needs of the event. Their suggestions included both the spatial and technological setup of the space and other available arrangements such as the choice of furniture and catering options. The management team also oversaw the design of each event and asked the event organisers to make changes as they saw fit to better align the aims of Qspace with the aims of the event. They also were present during the running of the event making sure things run smoothly.

“The [name of the space] is not a “bookable room” in the same way as other rooms on campus. Users of the Zone will have first worked with D., the Learning Facilitator, to devise a session that will use the Zone, and its unique facilities, in innovative and appropriate ways. Courses using the zone will usually be identified at least one term in advance - and possibly up to a year.

[Name of the Space] staff are on hand to help with the planning, preparation and delivery of these sessions, and there is full technical support on the day.

If you are interested in using the Zone then please contact D., the learning facilitator for an initial chat; once use of the zone has been agreed your session(s) will be pencilled in. You will then engage in the design of the session(s) with the zone team, more complex sessions might require a substantial “run through” before delivery. Because of the flexibility of the space and the technology careful planning is needed well in advance of the session, particularly for new users. The role of the learning and technology facilitators is to make this process as interesting (and painless) as possible for tutors - but a time commitment to this planning process will be required.”

Quite often providing this kind of event facilitation was talked about by Qspace’s managers as “*a necessary evil*”: they didn’t enjoy having to work so hard to pre-set everything but felt it was their duty, so that the space could be experienced as it was meant to with respect to its aims. These are explained in more detail in the next section.

5.3.2 Anticipated Use

Qspace is a Centre of Excellence in Teaching and Learning (CETL) that was created in 2007 as part of the Higher Education Funding Council for England (HEFCE) joint initiative. The CETL initiative aimed to fund the creation of academic environments that would promote innovation in teaching and learning. In total, 74 CETLs have been funded, each with a different educational focus. Qspace’s focus was creativity; its main purpose was to teach and encourage creativity in learning through an innovative technology-rich environment:

- To inspire and support staff and students in those subject areas which require students to understand and display “creativity”
- To inspire and support staff and students to be more creative in their approaches to teaching and learning, across all disciplines and subject areas.

More specifically, the managers and facilitators of Qspace aspired to establish it as a place where creativity would occur spontaneously but also be taught; where students would be offered “*exciting opportunities to work in an environment that fosters collaborative, self-directed and experiential learning*”²⁰. Their vision included bridging more formal teaching with informal learning, as well as using technology to augment creatively – and even revolutionise – teaching. To realise this vision, the managers and facilitators designed Qspace to be an unconventional space, minimalistic and highly configurable as described earlier. Qspace’s management team assumed that creativity begins with fuzzy, low tech notions of structure and that technology can be an effective tool after ideas have already formed. Their goal was to create “*technologically-rich, but not technology-driven learning spaces which free teachers and learners from the constraints of the traditional lecture hall and seminar room*”²¹. The need to maximise the users’ flexibility was considered a priority; both the physical layout and the technology in Qspace had been designed so that they would encourage users to configure and explore them.

Qspace’s notion of creativity was based on providing an unconventional space to work in without providing the usual artefacts for working with, such as desks and tables. Chairs were for the most part replaced with bean bags as they

²⁰ Quote was taken from Qspace’s official website.

²¹ Quote was taken from Qspace’s official website.

provided a relaxing and casual means that would encourage creative ideas. The assumption was that the less conventional artefacts people are given the more they will have to think out-of-the-box to work with the new ones they are provided with. Low-tech materials were also preferred to high-tech. Unconventional activities were also encouraged and the design reflected that both the walls and the floor tiles were writeable. The walls had been covered from floor to ceiling with a special material which allowed them to be written on with marker pens and easily erased – similar to whiteboards, that typically only cover part of a wall. The managers of the space considered having whole walls for writing on, as a way of inspiring creativity amongst groups. They strongly recommended it to all who considered Qspace for hosting an event and when teaching a course.

5.4 Event 1: Workshop on Shareable Interfaces for Learning

5.4.1 Description of the setting for the workshop event

The choice of furniture and setting up of Qspace for the purposes of the academic workshop were decided upon in a series of pre-workshop planning sessions between two parties: the organisers of the workshop and Qspace's managers. For this setup it was taken into account the activities that were scheduled for the workshop and Qspace's aims regarding creativity. The activities scheduled for the two days of the academic workshop included: keynote presentations, breakout sessions, discussions and a demo session. These sorts of activities are quite standard for academic workshops.

An idea of how the space was configured during the workshop is shown on Figure 5.3. Qspace's arrangement varied over the workshop sessions both in terms of seating and the spatial layout. More specifically, (1) in Figure 5.3 shows the space's arrangement for the keynote sessions: the main area of Qspace was used; bean bags, chairs and stools – chairs being the majority – were arranged in an auditorium style and the keynote slides were projected to the wall while the presenter stood or wandered between the wall and the audience. For the conceptual breakout session, Qspace was divided into four smaller areas. One breakout group, see (2) in Figure 5.3, formed a circle of chairs in the reception area of Qspace; while another occupied part of the main area and formed a half circle of mainly bean bags and a few chairs facing the wall where their slides were projected, see (3) in Figure 5.3. The remaining two breakout groups shared a smaller part of Qspace's main area that was separated by the movable walls. Both

groups formed a circle and used the chairs for seating, see (4) and (5). For the demo showcase session, Qspace's main area was further separated in small areas by the walls and the curtains. This way each demo or slide presentation had its own separate space where they could show their work unobtrusively and it was easy for the participants to browse from one area to the other - see (6) in Figure 5.3. For the design breakout sessions on the second day of the workshops only two groups used Qspace. One group sat in the reception area of Qspace forming a big circle of chairs (7); and the other one occupied the main area of Qspace that was arranged as an auditorium with a mixture of chairs, bean bags and stools, as can be seen in (8), Figure 5.3.

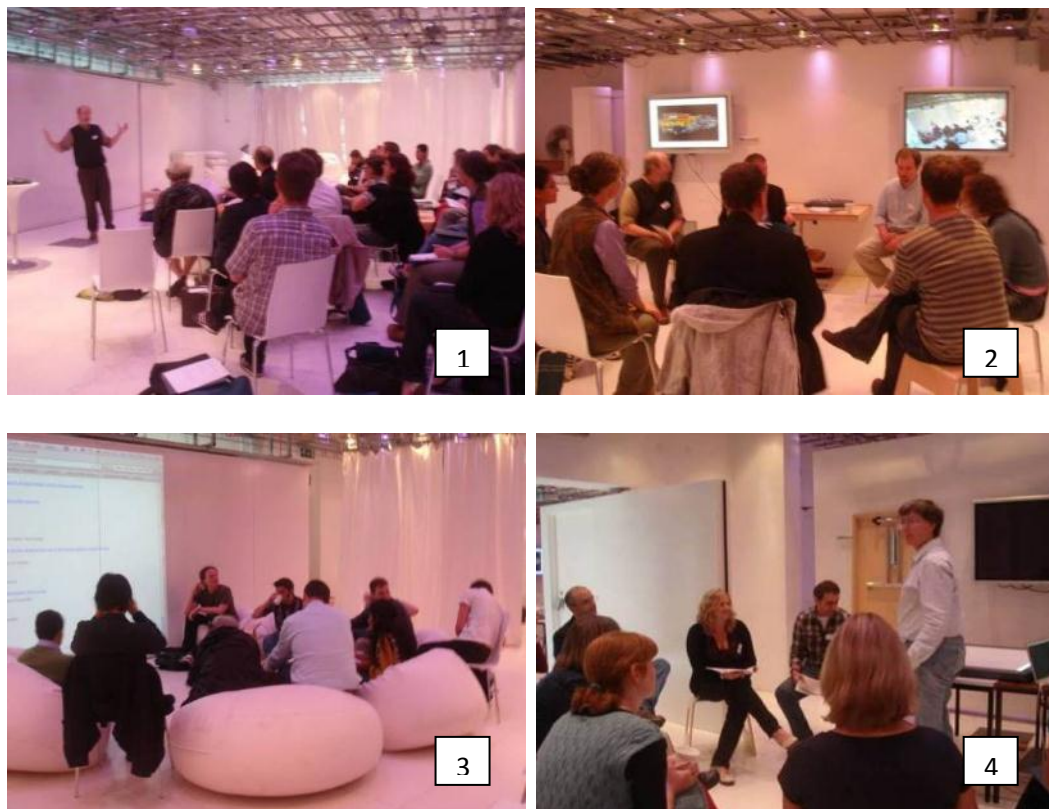




Figure 5.3. Different configurations of Qspace used during the academic workshop depending on the activity that took place: (1) Keynote session configuration; (2) (3) (4) and (5) Qspace separated in four smaller areas to accommodate for the four breakout sessions on the first day; (6) Demo and poster session configuration; (7) and (8) Qspace split in two areas to host two of the three groups for the design breakout sessions on the second day.

Most of the setting up (moveable walls, curtains, tables, cleaning walls, etc) took place between sessions, during lunch or coffee breaks, or at the beginning or end of each day. However, occasionally, it was observed that the managers rearranged part of the space during a session to change the lighting or open/close the curtains. These minor adjustments went on in the background. In terms of the technology, only one projector was used during the event for the keynote presentations, the round table and two of the breakout sessions. The PLASMA screens were used by the participants to present their work during the demo session. The workshop organisers also introduced a multi-touch tabletop surface to support one of the breakout sessions and some interactive technologies were brought by the participants to showcase their work during the demo session. An

example was the “Augmented Knights’ Castle”²², an interactive installation that uses music, sound effects, tactile and visual feedback to enrich children’s pretend play.

5.4.2 Actual use

Issues of technological infrastructure before and during the workshop

The way technological infrastructure of Qspace would be set up for the purposes of the workshop was negotiated extensively during the planning sessions and the actual event between the managers of Qspace and the event organisers.

From the planning sessions, it was observed/clear that the organisers’ wishes regarding the technological needs of the event conflicted with Qspace’s managers suggestions. The workshop organisers wanted to be able to use Qspace’s technological infrastructure in a *plug and play* manner in conjunction using their own technology. For example, for the keynote presentations the organisers wanted the speakers to be able to connect their laptops/netbooks to the projector just before the talk. This is a common practice for academic workshops and conferences where speakers often tweak their slides until the last minute. However, for the Qspace managers this was not a preferable option; they wanted to have all the keynote presentations available in advance – at least a week before the event – so they could store it in their system and make sure the presentations would run smoothly on the day of the event. Similarly, for all technological infrastructure Qspace’s managers insisted on having a preset technological arrangement where pre-agreed devices would be used for specific sessions of the event. Until the day of the event, there were many negotiations regarding this

²² For more information see <http://www.vs.inf.ethz.ch/res/show.html?what=akc>

matter that sometimes were triggered by the keynote speakers and expressed through the event organisers to Qspace's managers. Significant email communication²³ was exchanged with insistence from all parties. In the end, it was decided that there would be one laptop set up in advance by the managers where the keynotes could plug a flash drive in with their slides, although it was clear from the communication between all parties that this was a compromise from everyone's perspective. During the workshop, there were signs that to some extent the tension from this compromise had carried through. For example, during a slide show, one of the keynote presenters stumbled and almost fell on the table where the laptop²⁴ was setup. At the first opportunity, the managers referred to that incident to make their point as to why they don't allow plug and play and how "*it would have been simpler if the slide show was pre-set*".

Another incident regarding plug and play was observed to take place between managers and workshop participants when the latter at different occasions tried to plug their devices into the existing infrastructure. They were discouraged by the management who argued that plug and play could "*cause the system to crash*". For example, in the demo session, every participant who was using the PLASMA screens to show a slide presentation of their work was not allowed to set up on their own; instead they had to meet with the managers earlier in the day to set up their laptops or hand their slide presentations for pre-setting.

²³ For an anonymised copy of the email communication see Appendix 2.

²⁴ By 'the laptop' we refer to the one laptop that the managers had allowed in Qspace for the keynote session.

Other issues between the workshop participants and Qspace managers regarding the technological setup were prominent during the workshop. For example, providing the participants with the option to connect online was difficult; it took the first whole day of the event for this matter to be resolved. Plugging personal devices into the room's power supply was also not encouraged as it required moving wall surfaces or part of the flooring to find the power sockets that were hidden. Likewise, the managers' lighting manipulation – intended to create a relaxed atmosphere during the slide presentations – resulted in several complaints from the participants listening to the talks, as it was distracting and interfering with the visibility of the slides.

Overall, the observed use of Qspace's technological infrastructure was limited during the workshop. Even in the occasions where participants were allowed to configure and use the infrastructure themselves, this did not happen. For example, the workshop breakout sessions provided participants with the opportunity to interact with projectors and the ambient room lights in a more creative or less ordinary use. Instead no such use was observed; and with a few exceptions no use at all was observed. Apart from two groups that had pre-arranged with the managers to project slides on the wall, the others did not use any other means such as the lights or the PLASMA screens to support their work.

In contrast, one of the breakout groups that had to work in a meeting room next door to Qspace (due to insufficient space in Qspace) was observed to use the technology available. They connected a laptop to the TV screen browsing online to find material and information about their prototype and switched between laptop and TV screen while preparing slides and sketches for the presentation (Figure 5.4). In the beginning of the design breakout session, the group sat around the

table and used the PLASMA screen to watch the slide presentation of the design problem, see figure on the left); later on, a member of the group connected his laptop to the PLASMA screen and along with two more group members, they discussed possible design solutions (sketches and slides) for their presentation (see figure on the right).



Figure 5.4. Breakout group in more conventional meeting room using plasma screen for showing slides as created to others in the group

Issues of seating before and during the workshop

The choice of seating was also an issue of negotiation during the planning phase of the workshop event. From the variety of seating arrangements (chairs, bean bags, stools) the managers opted for the use of bean bags as the main seating option given it was a central feature of the space's design and in line with the aims of supporting creativity. Chairs suggested a more formal style that was not what Qspace was about. They made this explicit in the planning sessions and further continued with more implicit references such as “*we have to make sure we have enough bean bags for your participants*” and “*our chairs are very uncomfortable, the bean bags are better*”. To those remarks the workshop organisers replied that they would prefer to have mostly chairs given the workshop was a semi-formal event. Bean bags were also considered but not as the main option for seating. A week before the workshop, the issue over chairs versus bean bags was not resolved; the

managers suggested a compromise to “*use all the bean bags and some chairs in the back*” but the workshop organisers again expressed their preference to have “*more chairs and just a few bean bags*”.

On the first day of the event, when the workshop organisers arrived on site they found only bean bags in the space. They took it upon themselves to add the chairs and remove the bean bags. The managers were not very happy with this. One of them complained to the workshop organisers: “*Nobody is going to sit on the bean bags if you give them so many chairs!!*”. During the workshop the managers brought back the bean bags that were removed by the organisers and tried to encourage people to sit on them. They either sat on the bean bags, themselves, setting an example, or made encouraging remarks to the participants about the comfort and playfulness of the bean bags. Eventually a mix of bean bags, chairs and stools was placed in the space, providing the participants with the choice of where and how to sit for different sessions. A few tried out the bean bags, but most sat on the chairs.

During the two days of the workshop, bean bags were a topic of conversation amongst the participants. Their presence and use were explicitly talked about, eliciting both positive and negative reactions. The positive ones were accompanied by some participants jumping for joy onto and lying on them. For example, during lunch time one participant jumped onto a bean bag and exclaimed to two of his colleagues, “*This is great! They are very comfortable! We should buy some for our lab!*”. In contrast some participants expressed puzzlement and showed hesitancy when faced with sitting on a bean bag. Others thought they were inappropriate and suggested that the use of chairs was more suitable for an academic workshop. For example, one participant said, “*I have never seen this in a workshop before [annoyed expression]*”. On another occasion, one participant was

invited by another to sit on a bean bag and replied “...it doesn't feel right... It is very unusual [puzzled facial expression]”. In many ways, this difference in opinions echoed that of the workshop organisers and the management team. Some were prepared to be more playful whilst others considered such activity as not appropriate for a workshop.

Participants also expressed concern about their clothing when considering or having to sit on the bean bags - either by words or body language. Most of the concerns involved participants worrying or joking about their clothes not being appropriate for such a type of seating. For instance, one participant wearing a skirt said to another, “*I would like to sit on the bean bags but I don't think I have the right outfit [laughing]*”. The other nodded in agreement and added, in a more serious and concerned manner, “*I know... I would like to sit, too, but I feel a bit embarrassed...*”. In addition, people who had sat on the bean bags in contrast to those sitting on chairs, were often observed trying to adjust their clothing either consciously or unconsciously. In general, it was observed that more men than women chose to sit on the bean bags; and of the women who wore a skirt, none sat on the bean bags.

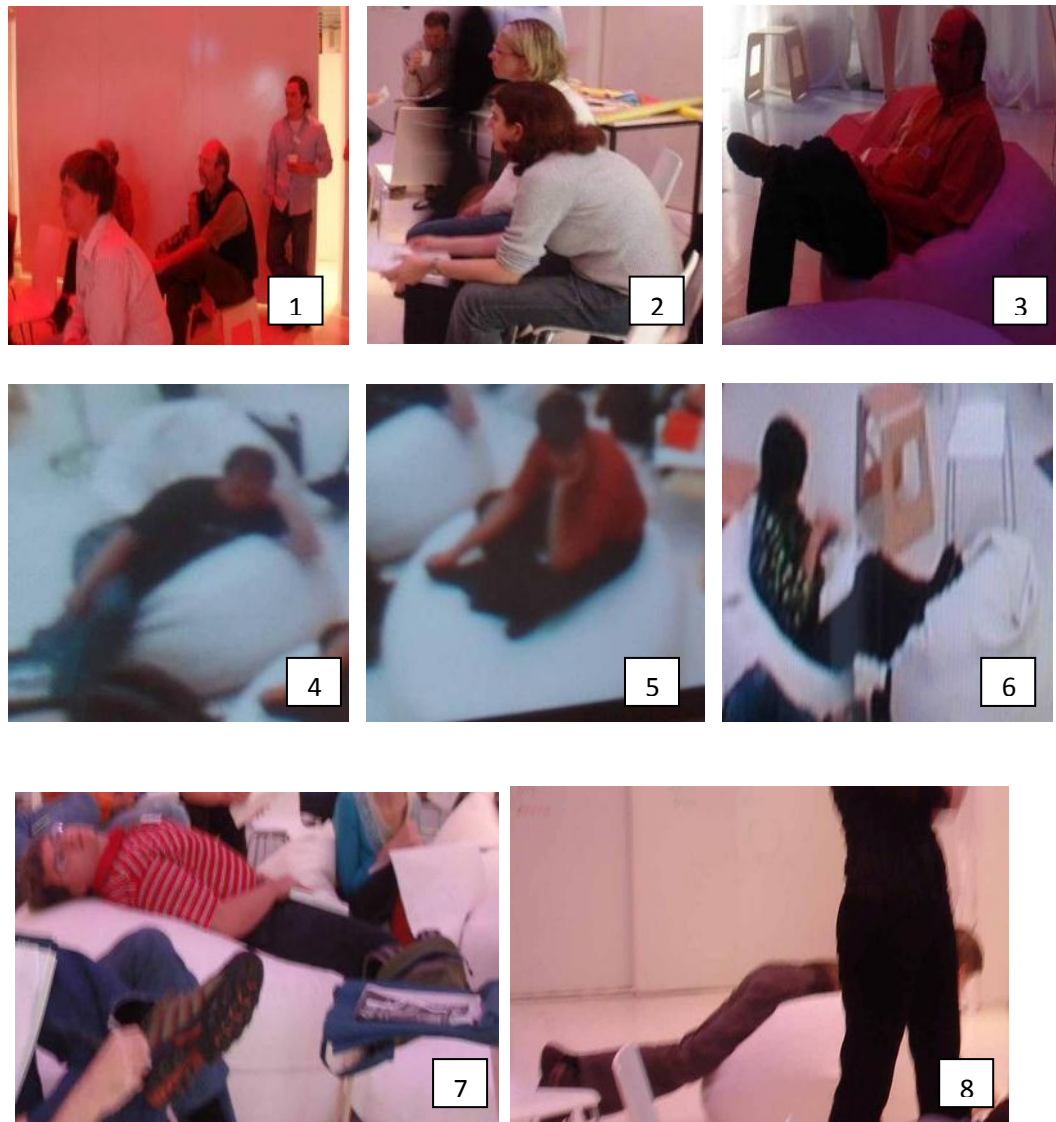


Figure 5.5. Different seating postures on chairs and bean bags

Further concerns about the presence and use of bean bags were expressed relative to the postures that they enabled. Stools and chairs proved less comfortable and people were often observed to seat in a leaning forward position (see (1) and (2) in Figure 5.5). The bean bags allowed for more comfortable seating but also for a variety of free-formed, relaxed and reclining postures (see (3-8) in Figure 5.5). Bean bag postures included *lying feet-up*, *lying face up or down* and a *yoga-meditating*. These more unusual postures were commented on negatively and considered inappropriate by a few of the other participants. For example, during

the keynote one participant pointed to another one who was ‘belly up’²⁵ on a bean bag and whispered to the person next to him: “*What is he doing!?* [disapproving facial expression] [inaudible] *I could never do this!*”.

Writing on the walls

Negotiations between managers and organisers also occurred before the workshop for planning regarding the use of writable walls. The workshop organisers were not in favour of using the writeable feature of Qspace’s walls. However, this was strictly non-negotiable from the managers’ part. Qspace’s managers had communicated this to the workshop organisers at the very beginning. Writing on the walls had to be integrated into the event’s various activities, as it would help the participants “*loosen up and unwind their creative self*”. The organisers conceded on this point, and agreed to use the writeable-wall feature, but only in one workshop activity. They acknowledged the novelty of wall-writing but considered using it excessively would be unproductive for the workshop’s purposes. Again, the managers insisted and called on their expertise from previous events hosted in Qspace. Finally, as a compromise, writing on the walls was incorporated in both breakout sessions of the workshop.

During the breakout sessions, participants were instructed or encouraged to write on the walls. At first, participants were observed to be hesitant or embarrassed writing on the walls. They approached the wall, but paused before writing, almost as if they wanted to make sure it was all right to write on the wall. Some of them later mentioned that they waited for others to start writing because they didn’t want to be the first to do so. In particular, for one of the groups, that was instructed to write on the walls, it was observed that only towards the end of the

²⁵ Similar to (7) in Figure 5.5

session they approached the wall and write up their ideas. Others mentioned that they worried they might use the wrong markers and damage the wall. Some people apologised in advance or made self-conscious comments about their writing being bad, or not very clear. In order to overcome the hesitancy and to write on the walls, it took encouragement and cajoling from the managers and organisers. For most participants, though, it was observing others writing on the wall that convinced them to have a go.

When people eventually wrote on the wall, they tended not to overwrite on others' work. Several participants were observed trying to shield the content of their writing from others by placing themselves in front of it. Legibility of writing on the walls was found to be an issue in cases where the content had to be shared by a group of people. It was difficult to read others' handwriting, when written with marker pens on the wall. There were occasions where the text illegibility obstructed the content's understanding and sharing. On one occasion, the letter characters were small and unclearly written; one of the participants pointed out that it was impossible to read if standing further away and suggested they re-write them more clearly and in bigger letters so that people in the audience could read them as intended.

During one of the breakout sessions, there was one occasion where writing on the walls became a more creative and expressional activity. This breakout session was run by a tutor with previous experience of Qspace. The tutor began by describing some of the techniques she uses with her students to get them to think and work creatively. Specifically, she introduced the participants to a game using their senses and imagination. They had to smell, touch and hear things while blindfolded (guided imagery) and afterwards they had to draw on the walls

concrete notions in abstract shapes and formations. The participants – although reserved at times during this unusual exercise – were observed to think out of the box. Some commented feeling quite inspired by this “*liberating*” experience, even laying on the floor or the bean bags to work prototype sketches (see (4) in Figure 5.6). Others gathered around a wall and started to brainstorm on ideas about their design (see (1) and (2) in Figure 5.6). Interestingly some of their suggestions were influenced by their recent creative experience. These included visualizing 3D-taste, creating musical mazes in an adaptable space and using light as ambient signage in the musical maze (see (3) in Figure 5.6).

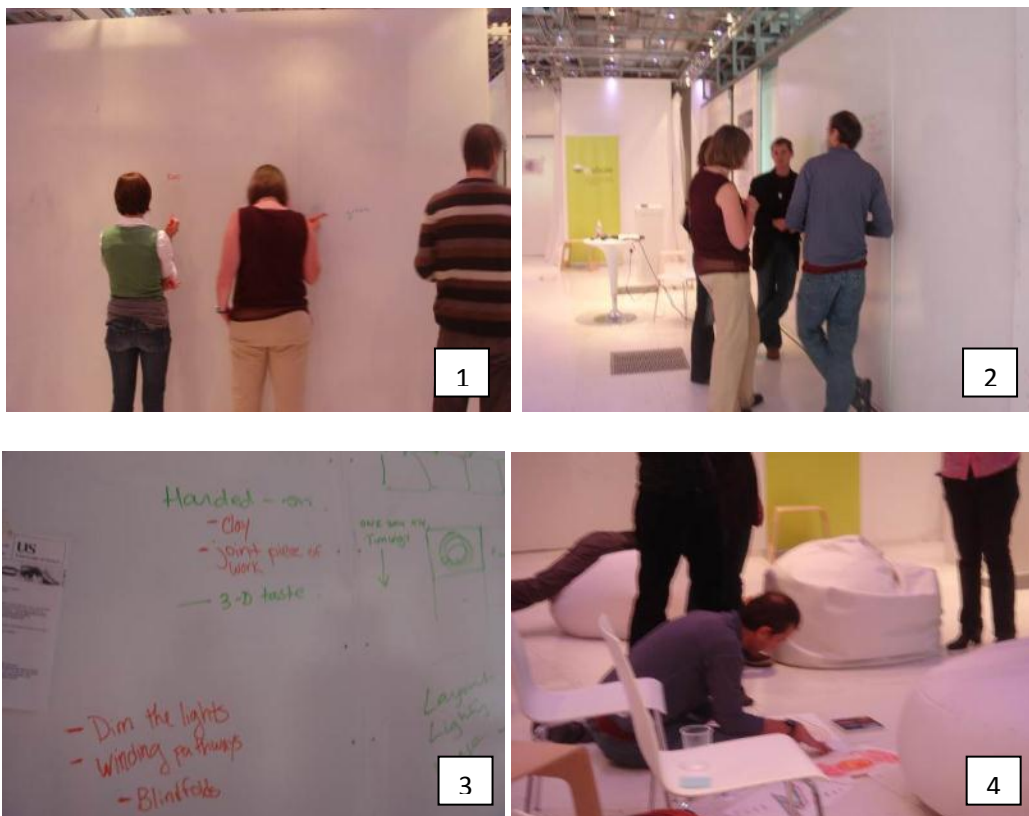


Figure 5.6. (1) Participants drawing on the wall as part of the guided imagery exercise; (2) brainstorming; (3) Suggested design solutions on the wall, and (4) participants lying on the floor and bean bags to work on their drawings

Creating tables and corners

Tables were not set up in Qspace as a default. There were only a few tables in the space and most of them were either stored or folded up against the walls. For the purposes of the workshop, several tables were necessary for placing technological artefacts that the participants had brought for the demo session in the end of the first day. All of Qspace's available tables were already being used for catering and as a result managers and organisers had to source out their need for tables by carrying more tables from other rooms in the building. Meanwhile participants had already worked around their need for extra surfaces by *creating tables*.

In most cases, tables were needed to place equipment on, such as laptops, notebooks, markers etc. In particular, when participants broke out into smaller groups, several wished there was a table where they could gather around to work on the given task. Others noted the lack of tables as "*unusual and inappropriate for a workshop*". A few were sceptical about Qspace's value as an innovative collaborative workspace. For example, one of the participants – that happened to be the manager of another CETL space – was particularly annoyed with the lack of tables and the managers' attitude towards this matter and commented in frustration: "*I don't understand how this is a collaborative workspace...it doesn't even have tables! How are we supposed to work?!*". Participants eventually succeeded in making do with the lack of tables. They appropriated chairs, stools and boxes to create tables. Any surface they could use to put their materials on, they did. These make-shift tables served a number of functions. First, tall cardboard boxes, stools and parts of physical walls that stood out, were used by participants in order to place laptops, leaflets, print-outs and other material on (see Figure 5.7). Second, the tall cardboard boxes were also used as work surfaces for some groups during the breakout sessions. Small groups of three to four people

gathered around the boxes and built paper and other low-tech prototypes on them (see Figure 5.8). The stools, which were much lower, were mostly appropriated by the workshop participants as tables for individual use. They used them to place their coffee cups, notepads, pens and pencils on. They also drew and wrote on them individually during the breakout sessions (see Figure 5.9).

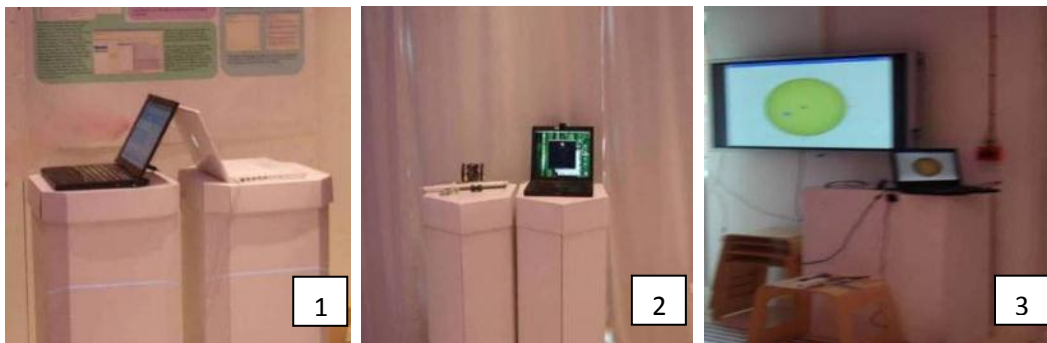


Figure 5.7. Use of surfaces to create make-shift tables (1) and (2) tall cardboard boxes; (3) parts of physical walls; (4) and (5) stools and cardboard boxes



Figure 5.8. Group doing low-tech prototyping on cardboard boxes



Figure 5.9. (1) and (2) stools were appropriated as individual tables for placing personal objects or working on them; (3) and (4) chairs being used as auxiliary storing areas

Similarly, during the breakout sessions, chairs served as auxiliary tables where participants could place their markers and colourful pencils, while drawing on a stool or the floor (see Figure 5.9). Chairs, on these occasions acted as storing areas.

We have seen how the participants appropriated what was around to create make-shift tables. Also what was observed was how they created corners. Participants were observed to create corners whenever they wished to engage in a more focused discussion by either re-arranging the seating or positioning themselves around the PLASMA displays to indicate private sessions (see Figure 5.10).



Figure 5.10. Semi-private zones, created by participant's posture and their positioning towards the screen or stands

5.5 Event 2: The Scrapbook event

5.5.1 Description of the setting for the Scrapbook event

The Scrapbook event was a public event that aimed to create and/or reinforce connections between the university and the local community. Information material about groups in the university and the community was provided in Qspace to encourage visitors to “*Be part of the Big Picture*” (see (1) in Figure 5.12). The main concept of the event was that visitors would go through the provided material and comment or add to it similar to a scrapbook. A range of discussions and presentations were also scheduled for the three days of the event.

The physical and technological layout of Qspace was fixed during the Scrapbook event. The facilitators had settled on a specific setup for the space and this was maintained for all three days. The space was set up in three areas: the reception, the main exhibition area and the workshop area. The reception area hosted snacks and drinks, the timetable of the day’s events and three information stalls. The majority of the information stalls and performances took place in the main exhibition area, (1) and (2) in Figure 5.11. The workshop area was mainly used as a seminar space late in the afternoon - see (3) in Figure 5.11. The PLASMA screens were used as slideshow stalls and only one projector was used for the seminar purposes.





Figure 5.11. Two of the three areas that were set up for the Scrapbook event: (1) and (2) main exhibition area and (3) workshop area

The intended feel of the event resembled an academic poster session and research showcase. A selection of academics and representatives from various community organisations were asked to publicise their work to the participants. They did this by putting posters and other printed material (leaflets, print-outs) on the walls of Qspace. Digital information was also shown on the PLASMA screens spread throughout the space. During the event, the representatives were standing next to their *information stalls* and were trying to entice people in approaching and contributing actively to their stall. They chatted to people who walked in the space and, occasionally set up mini performances to attract more attention (see (2) in Figure 5.12.



Figure 5.12. (1) Advertising banner of the Scrapbook Event; (2) Stall owner advertising his cause with a mini-performance

Again for this event three stakeholders were identified: the managers of Qspace, the event organisers and stall owners and the people who visited the event.

5.5.2 Actual Use

Interacting with the technological infrastructure

For the Scrapbook event the technological setup was more fixed compared to the workshop event. One projector was setup where PowerPoint slides were projected either in a continuous loop during the day or later in the afternoon for the purposes of the seminars. Digital information was also shown on the PLASMA screens spread throughout the space. This also consisted of static PowerPoint slides or a presentation of them in a continuous loop. These were setup for visitors to watch and no interactivity was intended to take place from the visitors' part.

The only device that was setup for visitors to interact with was a keyboard and a mouse connected to one of the PLASMA screen with internet access where visitors were invited to browse information and potentially add it to the walls of Qspace. Many of the visitors did not understand the purpose of this setup nor that the mouse and the keyboard were connected with the PLASMA screen as the table where they were placed was not facing the screen and further there was a laptop on the same table that despite appearances was not operated by the mouse/keyboard. When its purpose was explained (by the managers) and a few people were encouraged to use it, it was found to be rather uncomfortable and hard to use as people had to turn their head back every time they wanted to look at the screen. This was quite an unnatural position and restricted the interaction as users could not type or use the mouse and look at the screen at the same time (see Figure 5.13).

The screen was also connected to a printer so that visitors could print out information instead of re-writing it on the walls. However, the printer was located in the managers' office and not in the room. In the few occasions where

information was printed, the managers had to be reached and asked to collect the printouts for the visitor to add on the wall which was making the whole interaction cumbersome and more laborious than it needed to be.



Figure 5.13. Awkward interactions with plasma screen: (1) the participant has to turn his head towards the back in order to see the content in the screen; and (2) the participant has to sit to use the keyboard and mouse

Writing on the walls

During the Scrapbook event, both the event organisers and the people visiting the space were encouraged to write and/or add printed material on the walls. The event organisers that were also members of the different groups that were publicising their activities wrote and added material to the walls significantly more than the people visiting the space. From the moment the event began the stall owners together with the managers of Qspace started adding information to the walls of the space. The information written or posted continuously changed throughout the day as more stall owners arrived in the space. Stall owners added print-outs or handwritten comments to Qspace's walls and to banners. For example, early afternoon of the observed day (first day of the event) two stall owners were observed sello-taping printouts and writing comments on two banners as most of the wall surface was already occupied (see (1) in Figure 5.14). The banners were laid on the floor for a couple of hours before being hung to allow for more visitors to add comments to them.

Visitors were equally strongly encouraged to write on the walls or add printed information at any time. Similarly to what was observed in the workshop event, people were initially hesitant writing on the walls. They approached the walls and read the existing information. Only if someone explicitly encouraged them verbally or after they had ask someone for permission were people seen to start writing. However, when other people were already writing on the walls nearby, people were seen to start writing too without any hesitation. For example, one visitor while reading about the university drama club's performances grabbed a marker from a nearby chair and added information on an interactive installation for performative arts that some engineering students had recently built and presented at a workshop (see (2) in Figure 5.14).

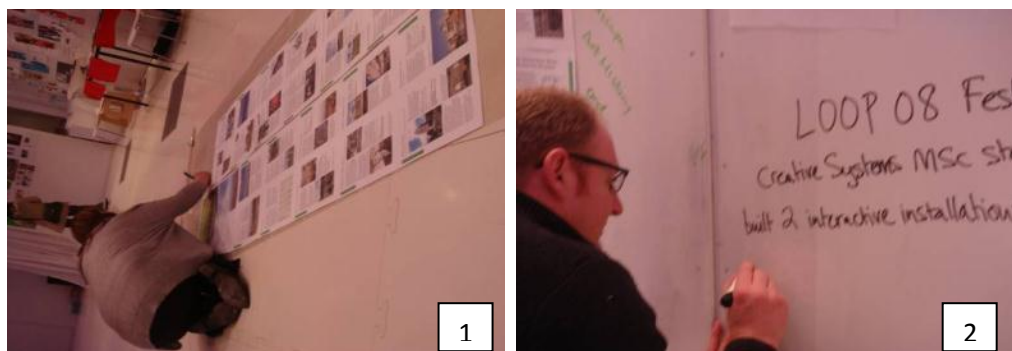


Figure 5.14. New information being added to the walls and banners during the scrapbook event

When people wrote on the wall, they tended not to overwrite on others' work. For example, when a poster or print-out was already on the wall and people wished to add information, they tended to write around it and never on it. On the other hand, when someone added a print-out or a poster on the wall, he/she was often observed to write on it as well as on the wall area around it (see Figure 5.15). Also, people were observed to erase or scratch out information only from their own wall writings and never from someone else's.

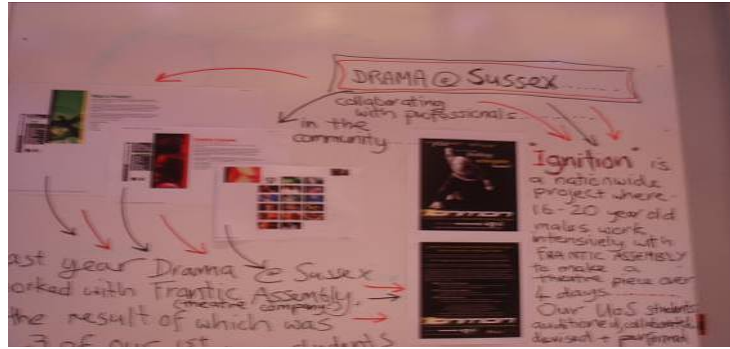


Figure 5.15. Writing and adhered printed materials on a Qspace wall

As the day moved on more and more people who visited the event drew or added post-its and other hand-written bits of information on the walls. The contributions varied both in content and presentation. Some of them were very personal – as if the person who wrote it was confessing to a close friend – and some were quite formal; others were humorous. Others questioned particular issues that were important for the student community (e.g. (2) in Figure 5.16). Some contributions were plain (written in black or just a post-it note added on the wall); others matched the decor and/or theme using eye-catching colours and drawings (e.g. leaves+trees+green=eco-friendly in (3) Figure 5.16). In general, most of the people who wrote in the walls got very engaged with the task.

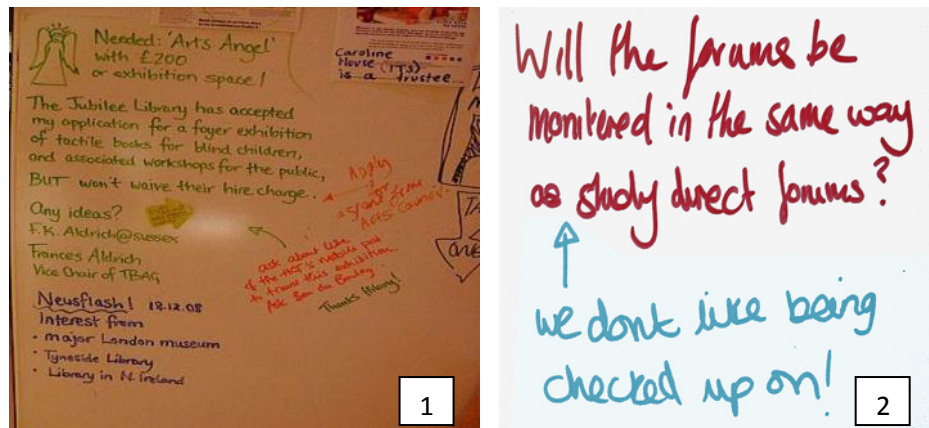


Figure 5.16. Examples of writings on the wall illustrating different personal styles

Creating tables and corners

At the scrapbook event, there were no similar strong reactions about the lack of tables, as in the workshop, but then there were also no breakout sessions or any need for people to collaborate towards a given task. In addition, compared to the workshop there were considerably more tables and yet the stall owners requested the managers to provide them with more.

Still people were seen create tables where necessary. This was mostly common with the event organisers and stall owners as they required surfaces to place their advertising material or other props for interaction with the walls (markers) and their posters. As in the workshop, they appropriated chairs, stools and boxes to create tables. Any surface they could use to put their materials on, they did. These make-shift tables served a number of functions. Tall cardboard boxes, stools and

parts of physical walls that stood out, were used by stall owners to place laptops, leaflets, print-outs and other material on (see Figure 5.17).



Figure 5.17. Use of surfaces to create make-shift tables (1) and (2) stools and cardboard boxes; (3) and (4) chairs being used as auxiliary storing areas

We have seen how the participants appropriated what was around to create make-shift tables. Also what was observed was how they created corners. Participants were observed to create corners whenever they wished to engage in a more focused discussion by either re-arranging the seating or positioning themselves around the PLASMA displays (see Figure 5.18) This was observed in both events, but it was more prominent in the scrapbook event. One possible reason for such behaviour to occur more in the scrapbook event seems to be the public nature of the event. Visitors in the scrapbook event were not acquainted with each other and the space was treated as public for the occasion, whereas in

the workshop event, the participants were specific and shared a priori common interests.

As a result, in the scrapbook event, whenever people wished to engage in a more focused, private discussion, they created corners with their bodies and their actions (re-arranging seating) to express their need to separate and protect their discussion from the unfamiliar crowd. Their posture and positioning towards the screen or the stand – especially while already talking with someone – was creating a semi-private zone, almost a kind of territory that was not easily accessible by bystanders. Even in the public spaces, however, not all actions were public.



Figure 5.18. Semi-private zones, created by participant's posture and their positioning towards the screen or stands in Scrapbook

5.6 Discussion

5.6.1 Actual versus anticipated use

Before considering each of the events separately, it is useful to first consider Qspace's original aims with respect to its actual use as this was exhibited by the two events that were hosted in the space.

Qspace was designed to support creativity in teaching and learning through an innovative technology-rich environment. Qspace was meant to be an environment for collaborative, experiential learning and where formal and informal teaching would happen in more unconventional ways that would foster and inspire creativity. While Qspace was certainly an unconventional space, its actual use did not often involve teaching. None of the two events observed were strictly related to any teaching activities of the university. As a result, it is difficult to even consider actual versus anticipated use in a strict manner. Through various conversations with the managers and other members of staff in the university, it was explained that only one course from the Design department was using Qspace for a limited number of lectures. The managers also explained that they had tried, since the space was created, to attract a number of tutors to use the space for their courses. Some of them used Qspace once but they found it hard to continue doing so due to the significant planning involved. Other tutors that the researcher spoke to, questioned the value of the unconventional design and counter-argued that most of the lectures could incorporate creative features in a conventional space. Qspace could enhance aspects of the teaching, but not using Qspace did not automatically mean that the teaching was not creatively approached or delivered.

Due to the tutors reluctance or unwillingness to use Qspace, the managers

had resorted to using Qspace for other activities that were of broader scope to the original. Interestingly though, they kept 'supporting creativity through unconventional design' high on their priorities even for events that were of different scope.

For example, in the planning of the workshop event, it became apparent that although the managers tried to help the workshop organisers in planning a creativity-based event in Qspace, it was not what they wanted. Conflict and tension arose between the two parties as to how best run the event. This asymmetry between original aims and anticipated use of Qspace and the different aims of the events taking place propagated to the way users perceived and used the space. Considerable effort was made to reconcile the different stakeholders (managers, event organisers, users); what was desired and expected and what was actually happening. Qspace's facilitation of physical and technological configurations resulted in a strenuous pursuit of managing facilitation between managers, organisers and participants that most of the times proved more hurtful than inspiring for creativity.

One example of this can be found in the choice of seating. Typically, arranging seating involves accommodating the number of people participating by providing enough chairs. In contrast in Qspace, seating was considered an important aspect of configuring the space to both get people out-of-the box and/or facilitate feeling relaxed and comfortable. On the one hand, the bean bags encouraged people who sat on them to be more relaxed and casual - which in the workshop was fine for breaks and occasionally for breakout sessions. However, when a talk, like a keynote, is happening the speaker likes to see an alert audience. Seeing a lounging audience can be off putting, suggesting they are not paying

attention. Many participants in the workshop felt that others lounging on bean bags was not appropriate. In general, the use of bean bags had a socially charged meaning. For some, it represented a welcome innovation and for others, a distraction to the ongoing event. Either way though, bean bags attracted attention; often this attention – negative or positive – was observed to be used as a social enabler, a starting point for breaking the ice between unacquainted participants. For the Scrapbook event, seating was not a contested matter but at the same time it was not a main feature of the set up as people were meant to browse around the space and not be seated.

Likewise, writing on the walls was a main feature of Qspace's design for engendering creativity and it was found – especially during the Scrapbook event – to inspire creative expression. However, it is important to stress that such creative expressions were manifested under particular circumstances. Sometimes, it was the events' agenda (scrapbook) or a particular task combined with a preparatory session (workshop) that enabled the creativity. Those activities fitted well with Qspace's unconventional design. Incorporating writing on the walls for every event would not warranty similar success as they didn't share the same circumstances. This was a weak point when it came to the managers' choice as they insisted on incorporating those features (writing on the walls, bean bags) on every event. They assumed that in order to engender creativity, staging or controlling the setting was required. However, trying to make creativity happen by following a plan seems to contradict the very nature of creativity and the two events observed raise questions as to whether such prescribed creativity can succeed. This form of contested terrain – between what the managers thought were essential ingredients for creativity, what organisers want and participants appropriate and do –

demonstrates how creativity is not a straightforward process but one that might be understood in different ways, depending on the people and the situation.

5.6.2 An unconventional space

Another issue with Qspace regarding the way people used it was its unconventional design. Similarly to the activities of writing on the walls and seating on bean bags, an all-white minimal design can be useful to inspire creativity under specific circumstances. It is possible that its free-formed and minimal design can remove to some extent social inhibitions and users feel comfortable and relaxed being and working in Qspace. For example for the Scrapbook event that had many characteristics similar to an art exhibition, having a minimal, malleable space with a broad range of lighting was optimal.

In addition, in both events observed, basic furniture (e.g. tables) would have facilitated group activities or simply comfortable being. People were seen creating tables i.e. appropriating available surfaces to to make up for the lack of tables and so that they could put their belongings, advertising material. For the workshop breakout sessions these make-shift table surfaces enabled the groups to share both the space and the information placed on the surface; use objects on the table as conversational props or interact with shared artefacts to help maintain the group focus and facilitate awareness within the groups.

The tables also provided a “*social shield*” (Goffman, 1963), through shared and private spaces. People tended to maintain a distinct workspace on the table (usually the area directly in front of them) as their “*personal territories*” (Scott, 2003) in order to mediate their interactions with the task-related and non task-related (food and beverage) objects and with each other. A personal territory appears to be an extension of one’s personal space, providing him/her with

dedicated space on the table for performing independent activities. Therefore, tables in Qspace were not just created to accommodate group collaboration; instead, most of the created tables were observed to accommodate for personal space.

Setting boundaries between private and public spaces was a strategy that the participants used as their way of contesting the space. They created tables that served as personal territories and, similar to Dspace, they also created corners whenever they wished to engage in an extensive conversation with others. Similarly, the publicness of writing on a wall without being able to know who is reading or to protect one's private self, seemed to be an issue for several participants in both events. When encouraged to write on the walls, participants were observed to feel uncomfortable and at times tried to shield the content of their writing from others by placing themselves in front of it. Hence, even in public (Dspace) or semi-public spaces (Qspace) not all actions are public. Even for actions that eventually may become public, people tend to need some personal space to start with. Moreover, personal and group territories appear to be separate with associated accessibility properties, defined and controlled through social norms. People restrict their personal territories to a *socially appropriate* area. For instance, people generally refrain from using the table space directly in front of others or, in Qspace people never deleted or wrote on top of other people's writing on the wall.

In terms of the use of technology, it was found that for most activities a low-tech rather than high-tech approach was adopted. In addition, the managers restricted *plug and play* modes of interaction and opted for more passive and pre-arranged uses of Qspace's infrastructure. A tension between encouraging re-configurability to support creativity and imposing a top-down rigid technological infrastructure is apparent. It is unclear whether this rigidity was sustained

because of real problems with Qspace's infrastructure (bugs, malfunctions) or whether it was fabricated according to the managers' assessment of each event.

Further, familiar tasks such as browsing online were seen become unfamiliar as with the keyboard/mouse incident in the Scrapbook event or the use of the LCD screens in the workshop. The contrast becomes clearer when considering the use of the standard meeting room during the breakout sessions of the workshop. While the availability of the technology was the same in both contexts (TV screen, laptops, internet connection), they were used quite differently. So why did one group use the technology and the other did not?

One reason as to why this happened could be because of the pre-configured and hidden infrastructure of Qspace. First, all the technological infrastructure of Qspace is centrally managed by a rather complex interface and as a result all of the video, audio or other settings are either preset before an event or, if needed, setup on the spot by the managers. Second, the minimalist architectural design of the space hides most of the visible cues of interaction; cables are hidden behind walls or on the ceiling, plugs are underneath floor tiles, and computers were out of sight. In contrast, in the more conventional meeting room they were highly visible and afforded plug and play (see Figure 5.19). Participants were observed to be more comfortable using their laptops with the technology provided. As a result, the everyday technology of plasma screens and PCs was unfamiliar in Qspace whereas it was much more familiar in the other meeting room. In the former it is not obvious what to do even for a simple task such as finding a plug socket. In the latter, the participants readily used the available equipment, such as plugging a laptop to a PLASMA screen because it was obvious what to do.

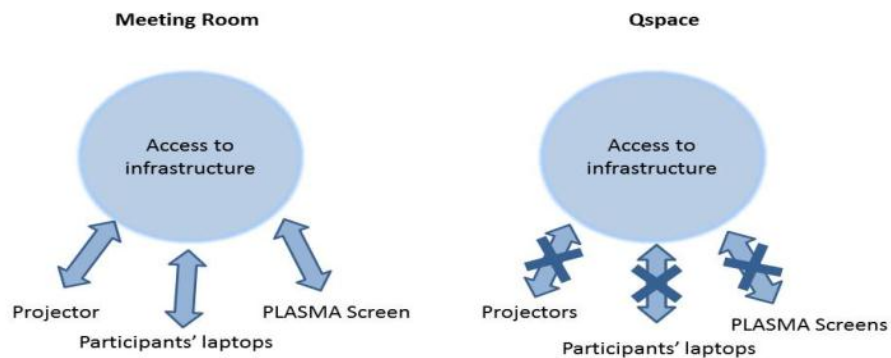


Figure 5.19. In contrast to Qspace, while in the conventional meeting room, the workshop participants were seen using all the available infrastructure (Projector, Plasma Screen) in combination with their personal devices.

5.6.3 Facilitating an unconventional space

The findings from the two studies revealed many activities and decisions were concerned with facilitation of the events. These were polyvalent, including how Qspace's managers planned in advance the technological, spatial and other configurations for each event, how facilitation and creativity were realised during the event and how both the planning and its realisation were experienced and negotiated between the involved parties (managers, event owners and participants).

To begin, we consider how the managers tried to facilitate events. The nature of the managers' facilitation activities was akin to *patrolling*. For example, they insisted on the use of bean bags, the writing on the walls and the pre-determined, pre-set use of the technological infrastructure irrespective of the needs of the event, its organisers and participants. In general, the managers were very hands on in setting up the events but at the same time their tight control of

management was a source of tension. From the observations of the activities organised for Qspace and the conversations with the different stakeholders, it became apparent that the management team assumed that by setting up everything themselves to the very last detail before and during each event, they would better support creativity and also make things easier for the participants and the event organisers. In this context, the managers' expectations of Qspace's ideal use were often observed to clash with the actual needs of the event.

Moreover, the careful planning and assistance, that was intended to facilitate teaching and inspire creativity, quite often hindered rather than facilitated them. This raises the question of whether such careful planning and constant facilitation was necessary in this space. For the managers of Qspace it is clear that they felt it was necessary. Only through their planning and facilitation, creativity could be provoked; and this needed to be patrolled.

Secondly, creativity was also viewed by the managers as an activity that could be facilitated. Designing a specific physical arrangement of furniture (bean bags) and particular unusual activities, such as writing on the walls would lead to creative behaviours. Their approach, therefore, was to *anticipate creativity with a plan*. While well intentioned, their efforts and ideas were problematic. The nature of the events and the characteristics of the group were resistant to being organised in such a way. Creativity cannot be engineered as such but needs to simply happen. For example, more creative instances were observed in the occasions where Qspace was used in a more open-ended manner with minimal planning and facilitation such as in the Scrapbook event. Often creativity is engendered through some degree of discomfort (which is what Qspace's minimalist design was intended to do in the first place) but also requires a level of comfort that would motivate and

allow individuals to express themselves out of the ordinary thoughts and behaviours. Furthermore, maintaining the same conditions for every event (writing on the walls, using bean bags, etc) can become ordinary and in doing so, too, comfortable to inspire or provoke any creative processes.

However, most of the times, it required one or the other to give up. Reality turned out to be different than the ideal. While the role of the managers was central to how Qspace was used; it would have been interesting to see what would have happened without their facilitation. Would participants appropriate and be more creative with the space and the technology in Qspace or would they be lost in the unfamiliarity of Qspace's minimalist design?

5.6.4 Further reflections on the facilitation of Qspace

Qspace was closed down in 2010 after 3.5 years in operation. The CETL initiative that was funding Qspace along with 73 other innovative learning spaces around the UK came to an end. As part of this process a final evaluation report was published. Here we examine some of the points raised in the report.

In particular, we refer to issues that have been identified by the managers as matters that needed addressing. Most notable are the planning and facilitation issues:

1. timetabling,
2. time and resource implications of the facilitation model,
3. inappropriate use of Qspace
4. tutors' fears over the level of investment and preparation required to use Qspace

5. lack of ownership over the space
6. lack of ownership and fear of the technology

These points resonate with some of the findings of our study of Qspace. For example, as observed in the studies reported here, the need for much planning and facilitation acted as a deterrent for its subsequent use. Similarly, the lack of ownership resulted in the space not being appropriated and used as it was meant to. For example, while Qspace's desired use was to involve users re-configuring the space technologically and spatially to provoke and teach creativity, in reality such reconfiguration was only accomplished by or through the managers of Qspace.

The managers also report on how they addressed the identified issues. Ironically, one recommendation was to have additional planning and facilitation strategies. For example, the problem of timetabling was proposed to be resolved by the managers through negotiating with the event owners; and by developing strong work relationships with the institution's timetabling team. This was acted upon, enabling Qspace managers to book and plan for events even more in advance (e.g. two terms in advance). To address the time and resource implications from the facilitation model, the managers resolved imposing restrictions on the use of Qspace by: a) limiting the events organised in Qspace to one per day; b) enforcing and maintaining a specific spatial and technological setup per session (thus suspending frequent re-configurations); c) encouraging the combination of sessions so they take up less time and; d) pausing Qspace's use during holidays or term breaks. To address avoiding any inappropriate use of Qspace, they proposed that they vet all proposals to use Qspace. For this, all event owners had to meet in advance with the managers to discuss the nature of the event, their needs and expectations from Qspace and also they had to fill a lengthy

form that included descriptions of the above along with other specifications. To address the tutors' fears over the level of preparation required to use Qspace, the managers proposed reinforcing their role in facilitating the sessions so there is less for the tutors to do.

The lack of ownership over the space was considered by the managers as being caused by health and safety issues and consequently addressed by: *“(1) High levels of health and safety signage; (2) Health and safety briefings at the start of every course, tailoring of permissions to suit levels of tutor experience and specific usage; (3) Exploration of management and legal models for Health and Safety from theatre; (4) Revisiting of furniture, e.g. removal of some sliding screens to remove ‘shearing’ risk”*. In the same spirit, the lack of ownership over the technology was addressed by: *“(1) User diagrams showing device position and clarifying connections; (2) Grouping of related hardware into local orientation pods; (3) Dedicated time for system development and upgrade”²⁶*.

This evaluation report highlights a number of points that were identified as problematic during the operation of Qspace by its managers. Many of these points resonate with this work. Further, what is noted here is the specific way in which the managers understood and accordingly responded to those issues which is with further facilitation. While this is not how this work understood these points, it is important to identify such differences in perspectives and find ways to bridge those.

²⁶ The full report is not included in the appendix due to size (70 pages), but is available and can be provided upon request.

5.6.5 Summary of outcomes

The study presented in this chapter reports on the everyday use of Qspace, an unconventional innovative learning environment designed to support creativity in teaching and learning, as this was observed and experienced by the researcher and talked about by its users. The descriptions of Qspace's everyday use answer the question of what takes place in this innovative learning space at an everyday context or in this case whenever it is used. Together with the descriptions from the other two studies, they provide an answer to the first research question (How do people interact with the architectural and technological infrastructure and each other in innovative learning spaces on an everyday basis?).

Further the discussion of this chapter contrasts the everyday use of Qspace with what was envisioned and anticipated by its managers and answers in part the second research question (How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?). Findings showed that Qspace's actual use was different to what it were anticipated by its designers and managers. The nature of the events that took place during the observation were not in line with the creative learning agenda of the space. Further, instances of creativity were often forced or lost in conflicts between the managers, the event organisers and the users.

The discussion in this chapter also begins to account for the potential reasons of this tension between actual and anticipated use, as part of a framework that will satisfy research question 3 (How do we account for the differences between actual and anticipated use of the spaces?). More specifically, the model of facilitation and the unconventionality of Qspace's design were found to make it difficult for people to use and appropriate. Contrarily to Dspace, Qspace was

facilitated to the extent of patrolling, with participants and event organisers left with minimal or no freedom to do things their own way (customisation and appropriation). The unconventionality of its design further made Qspace 'hard to read' both infrastructurally (technology and layout) and socially (e.g. what people were allowed to do, feelings of exposure). Accounting for these issues and finding ways to address them can allow for a re-alignment between actual and anticipated use. This is elaborated further in the Discussion Chapter of this thesis.

Chapter 6

Cspace

Contents

6.1	Introduction	163
6.2	The study	164
6.2.1	Choice of setting	164
6.2.2	Data collection	165
6.2.3	Data analysis	167
6.2.4	Participants	168
6.2.5	Ethical considerations	168
6.3	The setting	169
6.3.1	Setting description	169
6.3.2	Anticipated use	171
6.4	Actual use	174
6.4.1	Activities across booths: Co-existence of diverse activities	174
6.4.2	From working to socialising	176
6.4.3	Technology use	184
6.4.4	Patterns of collaboration: Transcending booth limitations	191
6.5	Discussion	195
6.5.1	Actual versus anticipated use	195
6.5.2	Sense of community	199
6.5.3	Summary of outcomes	201

6.1 Introduction

The study in this chapter follows from the previous two studies. Similar to Dspace and Qspace, Cspace was space that was designed to support a variety of learning activities in a comfortable and innovative way. However, it differs from the previous two settings in that its architectural layout was fixed.

The main purpose of Cspace was to support group work among computer science students. Another motivation was to accommodate for a variety of formal and informal learning activities such as teaching, studying, programming (document production and coding) and testing. Previously in Chapter 4, findings from Dspace suggested that the more functions are added in one setting the more ambiguous and confusing it can become to onlookers which, in turn, can hinder its original, intended use. Considering that Cspace's agenda was multipurpose, it remains to be seen whether tensions similar to those found in Dspace will arise. Following on from this work, a central focus for the analysis in the Cspace study was to examine what took place in Cspace at an everyday basis and compare that with its anticipated use. This included examining the use of the technology and people's interactions with the space and each other.

6.2 The study

The methodological approach employed in the Cspace study was again ethnographic, involving participant observation of naturally occurring activities and semi-structured interviews. Access and consent were negotiated and granted at all the different occasions and with all the involved parties (director, tutors, and students).

6.2.1 Choice of setting

Cspace was a CETL space chosen as the third setting for our ethnographic exploration. Cspace was an innovative learning space designed to support collaborative work between students as well as various other activities (individual study, practical sessions, programming etc). The reasoning behind this choice was that Cspace shared several common features both with Dspace and Qspace but at the same time it had a significant difference regarding how the concept of flexible design was materialised in terms of its spatial layout. In contrast to the previous two settings Cspace's furniture was fixed/immovable. The vision of flexible design that is a crucial feature of innovative learning spaces was however accomplished/embodyed through the technological infrastructure of the space that involved a combination of movable and immovable, personal and shared devices.

In addition, Cspace was chosen as its design was less unconventional to Qspace's: the initial analysis of Qspace's data had shown that the unconventional design was relating to the users' not being able to use the technology and the managers' having to continuously provide facilitation. Similar to Dspace and Qspace, Cspace was designed to accommodate for a variety of activities - formal and informal - in a comfortable and innovative way. Again a central focus for this

study was to examine whether and how multi-purposeness was negotiated and realised in an everyday context. This included examining the use of the technology and people's interactions with the space and each other.

6.2.2 Data collection

Prior to the first visit in Cspace, a two-hour meeting was set up with the director of the space. During this meeting, the purposes and other specifics of the study (e.g. methodological approach) were communicated to the director and as a result consent and access to Cspace were finalised. Further, the discussion with the director provided details about the making of Cspace, the initial ideas and motivation, its everyday usage along with issues that emerged after its making and occasionally led into changes. This information along with the collected online material about Cspace contributed significantly to gaining a deeper initial understanding about the agenda and use of the space. The manager further introduced the researcher to the tutors that used the space. The tutors were also informed about the purposes of the study and had the chance to raise concerns or provide comments. The tutors further provided input on how the specifics of the study could be communicated to the students and volunteered to enable that process. A short observational session of Cspace was also arranged for the researcher to get acquainted with the space and how data would be collected.

The observation and data collection in Cspace was completed in three phases. This provided the opportunity to observe a broad diversity of its everyday practices. Fieldnotes, documents and photos were collected in all three phases. The first observational phase took place in May 2009 for a three-day period. This coincided with the beginning of the Easter term exam period; as a result examination sessions, individual and group study sessions for exam purposes were

taking place. On average approximately 20-25 people (students and tutors) frequented Cspace during that time. There were more people in the two days when the examination took place and less (~10) on the other day.

The second phase took place in October 2009; a week of observational sessions was carried out in Cspace. The second phase took place at the beginning of the academic year so that newcomers²⁷ interaction could be observed. The interest with the newcomers followed on from the previous findings arising from the Dspace study, where newcomers' assumptions and use of the space were found to be influenced by the activities already taking place in the room. In addition, our analysis from the first phase indicated that Cspace users interacted with the space and the technology confidently and effortlessly. This raised an interest as to whether newcomers would find using Cspace as intuitive as it seemed for the users already observed or whether they had to learn how to use the space. For the second phase, we observed a week of the everyday life in Cspace that consisted of informal (study groups, individual reading sessions) and formal learning activities (tutored practical sessions) as well as non-learning activities (having lunch, rendez-vous point). The researcher also took part as a member of one of the teams in the practical sessions that just began that week. In addition to collecting fieldnotes, documents and photos, questionnaires were handed out to the student population of the practical sessions. The reason behind the questionnaires was to gather some collective information about when the students started using Cspace, whether they used other spaces in campus to study and also what they thought about Cspace. The questionnaires mainly served as a way for the researcher to

²⁷ The term *newcomers* is chosen on purpose instead of first-year students as our study established (from casual conversations and the results from the questionnaires) that the great majority of newcomers were second-year students.

corroborate some of the themes already emerging from the observations. Video footage that was already being recorded using existing facilities in Cspace were also scheduled to be given to the researcher, but these were not captured due to technical problems. On average, 20-30 students frequented Cspace on a regular day. For the practical sessions, the students consisted of two groups of 20-25 students.

The third phase of the study was conducted in February 2010 for a period of two days. During this period, issues that emerged from the analysis of the previous two phases were followed up. In particular, a focus was on the students' groups from the practical sessions that were observed in October and issues concerned with collaboration, seating and use of the technology. This time video recordings were captured for each booth, enabling us to examine the interactions during the practical sessions. However, the recordings were without sound due to some further issues with the recording software.

6.2.3 Data analysis

Similarly to the previous two settings, the collected data was considered and analysed based on the approach of situated action. The everyday interactions taking place in Cspace were considered in relation to the plans for its anticipated usage as this was reported or envisioned by managers and designers of the space. The analytic approach allowed also for potential other themes that emerged to be considered as expressions of the situated action that took place independently of the desired or planned action. The outcomes of the analysis are presented as themes of actual use in a section 6.4 and later on discussed with regards to the envisioned usage of the space. All the emerging themes are further considered in relation to existing literature and the research questions.

6.2.4 Participants

Participants in this study were all the students and tutors that had access to and entered Cspace during the three phases of the data collection. Primarily these were Computer Science tutors and students both undergraduates and postgraduates.

6.2.5 Ethical considerations

The manager of the space was informed about the research scope of this study (research questions, methodological approach) and the reasons why Cspace was chosen among the settings under investigation. Following, she granted access to the space and introduced the researcher to all tutors that might be using the space. Accordingly, the tutors using the space were informed in advance about the details of the study (research agenda, methodological approach) and agreed to the researcher's presence in Cspace as well as to data being collected in the form of fieldnotes. Further, in the later phase of the study all official gatekeepers (managers, tutors) verbally agreed for the researcher to have access to the booth video footage that was already being recorded daily. Students using the space were already informed that they were being recorded by signage around and outside Cspace.

Upon the manager's and tutors' recommendation, information about the study taking place in Cspace was communicated to the students i) verbally by the researcher; ii) verbally by the tutors and iii) in written – both via individual hand-outs and in the form of posters inside Cspace. At any point, participants (students and tutors) were given the choice to opt out and their data would be deleted immediately.

6.3 The setting

6.3.1 Setting description

Cspace was a Centre for Excellence in Teaching and Learning (CETL) in Computer Science, situated on the third floor of the Engineering Department building in a UK university campus. Similarly, to Qspace, it was the only recently renovated space in a building that dated 10-15 years old and mostly consisted of engineering workshops and laboratories. The location of Cspace was not easily detected as the numbering of the rooms in the building was not marked clearly and the only other signage of its presence consisted of printed A4 papers posted in the staircase of each floor.

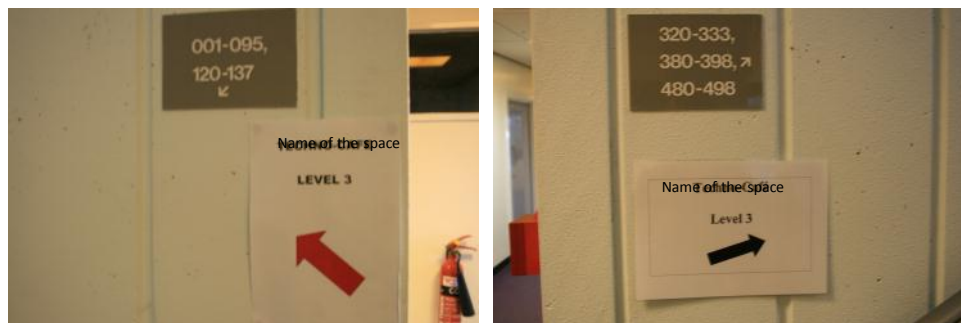


Figure 6.1 Printed A4 papers posted on the bottom of the staircase of each floor of the building to indicate the location of Cspace

Access to the space was granted only to engineering and computer science students and controlled via the use of a swipe card – similarly to Dspace. Cspace consisted of ten booths – five on each side of the room separated by a large corridor of high tables with laptops on them – that could accommodate from 6 to 8 students each. In every booth, there was an interactive SmartBoard, one or two tablet PCs and laptops. Lighting (top and back lit to avoid glare on screens) could be controlled independently in each booth by dimmer switches. The booths had

some soundproofing qualities; ensuring groups working in adjoining booths did not disturb each other. At the entrance, there was a smaller area with some benches and a vending machine that sold snacks and drinks.

Several months after the opening of Cspace, the manager together with the tutors using the space, considered that it would be useful to add some additional monitoring equipment to support formal teaching in the space. This was based on the concern that, due to the booth design, the tutors were unable to see and keep track of what happened in each booth and intervene if any group was in need of assistance. To address this, a podium with a PC and two monitors attached to it was installed in the space (see Figure 6.2); specialist software, developed specifically for Cspace, ran on the podium PC and communicated with the cameras installed in the booths. The cameras provided real-time feeds from the booths, allowing the tutor to monitor the activity within the booths and control input image projection from his/her PC to the SmartBoards. The sound and video capturing facilities could also be used by the students for podcasting, and Skype sessions with non-co-located groups.



Figure 6.2. The tutor's podium at the front of Cspace

Access to Cspace was available to all computer science and engineering students and staff. However, as the director explained, it was mostly computer science

students and staff that used it. One reason for this was that computer science students had to use Cspace as part of some of their courses while engineering students did not. Also, as it will be described in section 6.4.2, computer science students eventually claimed total ownership of the space.

Cspace was designed by the combined contributions of its manager and an architect that was hired to assist with both structural and aesthetic aspects of design. For its design, a number of requirements relating to its use were taken into account as well as some specific layout constraints from the manager. These are elaborated in the next section.

6.3.2 Anticipated use

Cspace's main purpose was to support collaborative work among computer science students. The idea for having an innovative space to support collaborative learning between computer science students emerged from a reported lack of a similar work environment on campus. An evaluation of the existing campus spaces, together with the findings of a focus group and a survey, described the available spaces and IT laboratories as suitable for individual work but not well suited for group work. In addition, the students described the existing spaces (e.g. IT labs and library study rooms) as functional but not pleasant and, also, expressed their discontent at not being able to consume food or beverages in those settings. These concerns and the overall feedback from the students fed into the initial requirements for the design of Cspace. This identified need that led to the inception of Cspace was also in tune with the broader scope of the CETL initiative that encouraged a shift away from passive learning in higher education and sought to "*facilitate a shift towards far higher levels of active student engagement where knowledge is obtained by sharing, problem-solving and creating*". In Cspace, same as

in other innovative learning spaces, features of flexible design were brought in to accommodate this goal: “[Cspace will] allow students to work together in a comfortable environment supported by flexible and time-saving technologies”.

In addition to its main purpose regarding collaborative work, Cspace aimed to support and possibly enhance a variety of formal and informal activities. More specifically Cspace’s anticipated use involved supporting:

- Teaching; as a space where formal teaching could take place
- Thinking; as “a quiet study area for individuals”
- Coding and testing; as an area where computer science students could program and produce documentation relevant to their code as well as test and experiment with hardware solutions
- Communication; as an area where informal *group discussion is facilitated (...)* where students can email, use mobile phones, have coffee and lunch without disrupting others.

To accomplish these aims a particular design was chosen for Cspace. The designer and director of Cspace decided – with the aid of an architect – on the final design of Cspace, taking into account these initial requirements together with her personal ideas on how computing students could work more effectively in groups. The director’s vivid memories of spending hours in a Pizza Express,²⁸ with diner style booths, while working on group assignments as an undergraduate student gave her the inspiration to make the space look like a diner and this resulted in the cocoon-like design of Cspace (see Figure 6.3). Such a design afforded privacy and

²⁸ Pizza Express is a chain of pizza restaurants with over 300 restaurants in UK and Ireland.

face-to-face communication but at the same time presumed a considerable degree of intimacy for people to co-exist comfortably in the confined area of the booth. In typical diners, people sharing a booth usually know each other in advance and are comfortable – to some extent at least – sitting so close to each other. However, in Cspace not all students were friends or acquaintances with each other and, in particular, for their practical sessions they were expected to share the booth with people they didn't know as the teams were chosen randomly by the tutors. A question this raises is how comfortable would they be in such an intimate setting? What would the appeal of a space so different from the traditional IT labs be for computer science students?

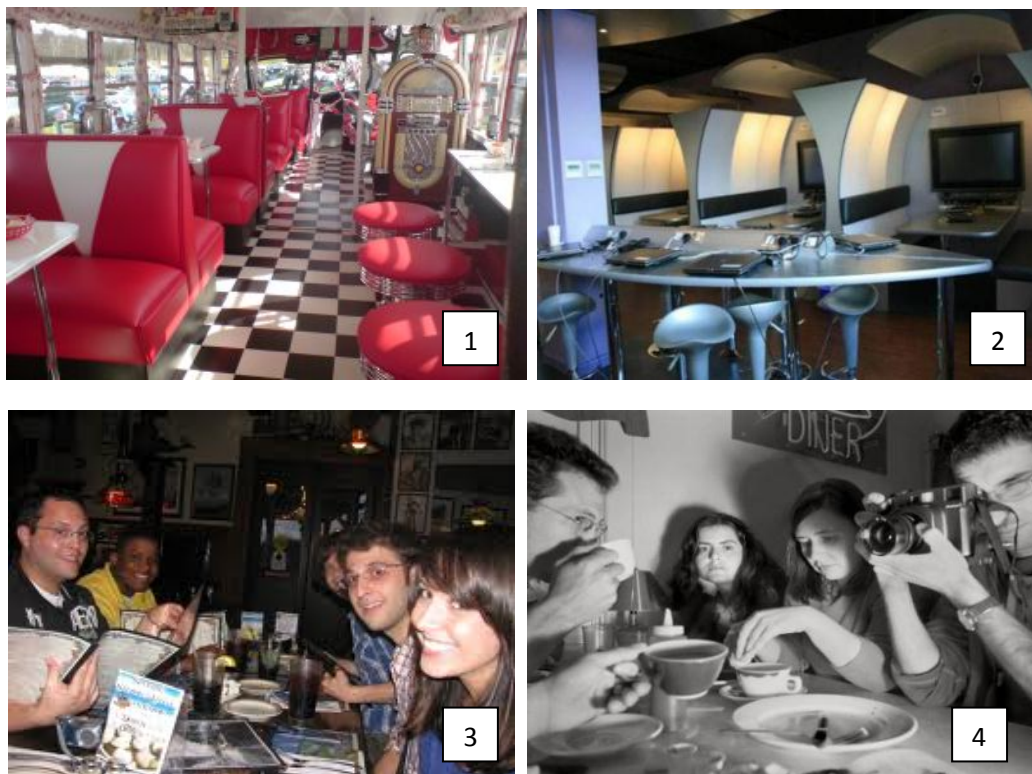


Figure 6.3. (1) A typical american diner contrasted with the design of Cspace (2) with high tables and stools and booths with tables and facing couch seating to allow for prolonged use; (3) and (4) show friends seated and sharing in diner booths

6.4 Actual use

In Cspace diverse activities co-existed in harmony; students collaborated in a variety of ways; they also switched seamlessly between studying and socialising, using their personal devices and the space's.

6.4.1 Activities across booths: Coexistence of diverse activities

Cspace was found to accommodate a diversity of activities from socialising to formal learning. The different activities occurred in parallel at the different booths, be it during software engineering practical sessions, exams or other events. In contrast to the cornering and whispering behaviours observed in previous settings, users of Cspace engaged in diverse activities and co-existed without exhibiting similar 'quiet' behaviours.

Cspace's users were not disturbed by others' activities. For example, a common occurrence in Cspace during lunchtime involved one group of students having lunch in one booth and in the adjacent booth another discussing or working on an assignment. The loudness of the group eating lunch didn't seem to bother the focused readers and similarly the quietness of those working didn't seem to affect those eating lunch from being loud. The body language and the overall demeanour of the students in both sides indicated they were comfortable co-existing; no whispering, no angry staring and no creating corners were observed. Figure 6.4 shows four screenshots of the interactions that took place at the same time in four booths during one of the practical sessions. In the first screenshot, two students are working on a joint assignment; in the second, one student is studying individually; in the third, one of the student teams from the practical sessions is reporting to the tutors on their progress; and in the fourth, two students are relaxing after having spent a few hours working in the booth.



Figure 6.4. Photos of the variety of activities that co-existed in Cspace: (1) Working in pairs on a group assignment, (2) Individual study, (3) Practical software engineering sessions with the tutors present, and (4) relaxing

Another example of diverse activities co-existing in Cspace took place during an exam event. This particular example illustrates how the co-existence was unproblematic even during formally structured teaching activities, such as an exam. More specifically, at the time of the exam, six out of the ten booths were occupied. In three of them, there were groups of three people, two of which seemed to be academic staff and not students. The interaction in the three booths was more or less the same and looked quite formal. The two of them were seated on one side of the booth while the student was on the other. A PowerPoint slide was displayed on the shared screen and the two people on the one side were asking questions while pointing to the document. Later it was confirmed to the researcher that an exam was taking place. In the two other occupied booths, groups of students were chatting relatively loudly and having coffee. In the remaining occupied booth, two students seemed to be studying – later on the researcher talked to them and they said they were postgraduate students revising for an exam.

This coexistence of diverse activities was unnoticed by the locals (students and tutors). As mentioned earlier, no whispering took place; no one's posture or

demeanour indicated that they were unhappy or uncomfortable with what took place in Cspace. Furthermore, when some of them were asked directly about it by the researcher (e.g. “*Are you not distracted by the noise from the other booths?*”), the majority replied that they didn’t even notice and a few of them tried to provide some explanation by linking it to the spatial layout of Cspace, i.e. the booths.

The unproblematic coexistence of the different activities seemed to happen – at least to some extent – due to the efficacy of the cocoon-like design of the booths. As mentioned earlier, the booths were soundproofed to some extent. Apart from their soundproofing quality, visibility had an effect: the view in each booth was restricted to outsiders; usually only the group sitting in the booth across could see what happened in another booth. By blocking view to/from others, the booth design might have allowed students and tutors to occasionally forget the presence of others and work as if it was only them in the room.

6.4.2 From working to socialising

Another theme that emerged from the analysis was a continuous shifting between work and non-work-related activities within each booth. Students switched effortlessly between reading, writing code, debugging, solving problems to chatting, checking their emails and Facebook, browsing YouTube and then returned to their previous work state. This kind of, what we are calling, *socio-work* just happened naturally; to-ing and fro-ing between the students in the booth, without being pre-negotiated, forced or discussed.

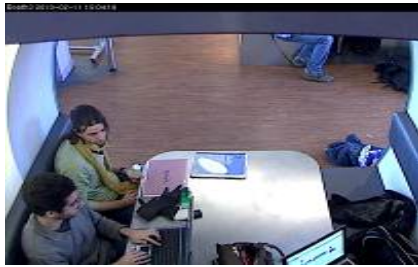
Furthermore, socio-work took place regardless of whether students were working individually, in groups or tutors were present. Individual workers in Cspace often shifted their attention from their monitor or their notes and books in order to check the messages on their mobile phone or make a phone call and then

immediately returned back to working. Similarly, they briefly checked their emails and Facebook updates and depending on what they found, might move to another booth to share with others, pause for a short or long period of time and then return to their work.

In groups, shifting between the social and the course-related activities often took place without any explicit signal. For example, there were individuals within a group that shifted from working to checking emails, messages etc, and imperceptibly back again. In this case, the individual socio-work usually had no effect on the rest of the group. A variation of the previous case involved the socio-work of one individual being transferred to the group. In that case, for instance, one person within the group would have a break, browsing Facebook, YouTube etc, and find something that he/she decided was interesting or funny enough to share with the rest of the group. Automatically, his/her sharing with one or more members of the group initiated the shift towards all having a look, indicating it was OK to have a social break. Another variation, involved the group shifting to a social break mode due to someone from another group interrupting their work. It was a common occurrence especially during the practical sessions, for students to go to other booths, either to catch up or to discuss some work-related issue. Even if the interruption involved a work-related issue, it was observed that the majority of the interrupted group would go into socialising mode. However, there were also instances where members of the group did not follow others but instead continued working without any indication of being annoyed or interrupted and had their own break at a different time.

To illustrate in more detail how these switches took place, two examples are provided of the seamless, interchanging and diverse nature of socio-work in

Cspace. The first took place in booth 3 during one of the practical sessions. The students were working on a group assignment until the arriving of some newcomers created the opportunity of a social break. From that point on, students were moving from work to non-work activities and vice versa for the next two and a half hours, either as a group or individually. A summarized version of the fieldnotes that describe the selected screenshots is provided to help understand the storyline:



15:04 Three students (one is not visible) are working in the booth on their assignment.



15:30 Two newcomers are joining the group. There is a commotion that spreads to the pre-existing members; working is not the prevailing activity anymore.



15:31 Two of the students that were working until 2 minutes ago have stopped; one of them is chatting with one of the newcomers (girl in purple) and the other -previously non visible- is stretching and yawning. The other student has left the booth.



15:40 Guy on the left is still chatting with the girl in purple, while girl on the right grabs the opportunity for a short nap.



16:00 *Back to work: almost 30 minutes later the group is back to work.*



16:12 *Changing seat in the booth to work with student across. The girl in the corner continues work as well. Two members of the group are not present.*



16:39 *Another impromptu break as the group is re-organising; some are leaving and some are staying to continue working. The guy on the right continues to work while the others are chatting.*



17:02 *The two remaining members of the group are using the shared display for collaborative debugging.*



17:58 *'Joke time'; a fifteen-minute fun break before heading home.*

As it can be seen, over a period of three hours, there were social breaks almost every thirty minutes. Some of them were long (30 minutes) and some of them were short (5-10 minutes). The breaks were not always synchronous for all members of the groups; some had a break while others continued working. This was a main feature for this style of work: not everyone had to participate in the break or for the whole duration of a break and not everyone had to work when others worked. Work and socialising were not antagonistic but complementary practices and were both understood – or tolerated – as such by the members of the booth.

The second example shows instances from the group work, taking place in booth 1 from 16:40 until 17:40pm; this group's practical session has finished but they didn't leave Cspace. Instead, they stayed to work on their assignment some more. They first work together and then have a break to stretch, check their mobile phones and Facebook. Then, they go back to work, later some of them leave and another break takes place. For the third time, they return to work until it is time for one more student to go.



16:50 Four students are in the booth, working on their software engineering assignment.



17:00 Ten minutes later one of them is standing, (to stretch?) and another one grabs his mobile, while still chatting with the student next to him about the assignment.



17:02 Break time: Student in yellow stretching while chatting about YouTube videos with student next to him. Student in grey one is checking his iPhone and the one in the corner is checking his emails.



17:08 Less than ten minutes later the majority of the group returns to work. Only the student in grey with the iPhone is not [Seems to be playing a game on the iPhone].



17:19 Student with the mobile phone has left, the other three continue to work. Seems like another one is ready to leave: he stands next to the student in yellow, discussing about some part of code while getting his things ready.



17:21 Student previously standing just left; the other two are having a break, checking and texting on their mobile phones.



17:23 Back to work.



17:34 Student previously sitting in the corner just left; student in yellow stood up so the other could leave, but still working. He is chatting with one of the tutors that are still in Cspace about some problems with his code.



17:38 Checking the mobile phone (arranging to meet with others for dinner/drinks?) while finishing on some work.

In this example, the transitions between having a break and going back to work are more swift and subtle. A simple action, such as one person standing or stretching or checking their mobile phone goes almost unnoticed but is enough to signal that at least one member of the group has stopped working and potentially got other members to join. Body postures also indicate gradations within the work or break period. Students change from slouched positions to more upright and then stand while still engaged in working or talking about work related things before leaving (see for

example, photo with time stamp 17:19 and transition from 17:23 to 17:34). All of these examples show that between checking Facebook, typing messages on mobile phones, stretching, napping, joking, eating, drinking coffee, work still gets done.

6.4.3 Technology use

In this section, the way the students used both their own and the technology provided in Cspace, is examined. A main observation was that students were continuously 'plugged in' either by using their personal devices and/or the space's infrastructure. Depending on what they wanted to achieve, they moved between the different technologies. For the students, these transitions and plugging in were part of their everyday practice and happened effortlessly. The tutors, on the other hand, rarely used the technology in Cspace.

Connecting personal devices in Cspace's infrastructure

Students using Cspace were found to bring in their own personal devices (e.g. laptops, netbooks and smart phones) and seamlessly integrate them with the existing technology (see Figure 6.5). For example, during the practical sessions, there were many instances where students brought their laptops into Cspace and connected them to the SmartBoards installed in the booths in order to show their work group and the tutors what they had been working individually. The majority of the students – newcomers included – plugged their personal devices into the existing infrastructure without asking for help and without being instructed on how to do so. This practice was performed in such a familiar and automated way that it was barely noticeable. Moreover, students felt comfortable enough to even unplug the other students' devices from the shared display without asking specifically for permission. Permission was unanimously and tacitly granted the moment one member of the group indicated there was content in their device that needed/had to be shared.

To illustrate the effortless use of personal and existing technology in the space, two examples from the fieldnotes are provided. On one occasion, a group of four students walked into one of the booths to work on their group assignment. All the students carried their personal devices; two of them had netbooks and the other two laptops (see (1) in Figure 6.5). They took the devices and their power cables out of their bags and plugged them into the power strip under the SmartBoard. One of them used the Ethernet cable to connect to the internet. The students casually chatted while setting up their devices in the booth. For the most part, the students went through the process of plugging in, without any checking or negotiation taking place. The only time they checked was when they glimpsed at the power strip to make sure there was a free socket for their device. Later, one of them connected his laptop with the SmartBoard to share his work with the rest of the group. Again he didn't ask or check with anyone before doing so; he briefly looked at the cables in the booth, grabbed the one connected to the SmartBoard and then focused back on his screen while plugging the cable to one of the USB ports on his laptop.

In addition to their netbooks and laptops, students carried their mobile phones with them. While the mobile phones were not used in combination with the booth's technology – at least on this occasion – they laid them onto the table next to their laptops/netbooks (same as before, Figure 6.5). This enabled students to check their messages or take calls while working. At the same time, this message checking and call receiving reinforced socio-work, as it enabled opportunities for interruptions. Phone calls and messages brought news from the outside world that occasionally were shared with the rest of the group – and led to a social break from work; or meant that the students had to stand or move to answer them which, again, triggered possible interruptions from work.

On another occasion, a group of students was working in one of the booths during a practical session. One of the students was working on the tablet PC provided in the booth, while the other three had their personal devices; two of them had laptops and one had his personal tablet PC. During the session, three of the students alternated between using the SmartBoard to share the content of their devices with the rest of the group. On most occasions, one student passed the cable to the other and less often one disconnected the cable himself from the other's device. When the student with the personal tablet PC was the one sharing content – which was often the case – he used his smart phone to browse for work-related content in the web (see(2) in Figure 6.5) instead of the tablet PC. It is possible that he did this to preserve the shared content on the SmartBoard while retrieving relevant information. As in the previous example, the students plugged their devices in the booth without any negotiation or difficulty.



Figure 6.5. Students (1) using their own laptops and (2) plugging them into the SmartBoard in the booth

In addition, the ease with which students could connect and disconnect their devices or their content from the shared SmartBoard display allowed them to maintain some aspects of their work or screen as private. For instance, it was observed that the person whose laptop was being shared through the SmartBoard with the group, occasionally took his screen out of *projection-shared mode* just with a single tap on his

keyboard in order to perform more private online activities such as check his emails or chat.

During the study, there was only one incident where a group of newcomers was having trouble using the technology in Cspace. The students wanted to use the SmartBoard. Unfortunately, the SmartBoard in their booth was not responding. For fifteen minutes the students tried a variety of possible solutions to get the SmartBoard to work (e.g. fiddled with the cabling, checked software and plugged different devices). In the end, they managed to figure out the source of the problem – the SmartBoard was switched off – but they couldn't locate the switch and decided to ask the students in the adjacent booth for help.

Similar troubling encounters with technology have been reported in our previous settings and particularly in Dspace. However, Cspace was different, both in terms of the frequency of such incidents and in terms of the coping mechanisms observed. In Cspace, the students did not hesitate or question at any point whether they were allowed to fiddle with the cables or make changes to the software to fix the problem. Also, the decision to ask for help was not negotiated as a critical decision²⁹ but was acted upon in a casual way similar to asking someone what time it is. Some possible explanations for the observed differences in interacting with and troubleshooting technology between Cspace and the previous settings will be discussed in section 6.5.

Moving between technologies

Depending on the specifics of the activity at hand, students moved between using the technologies available to them. Students did not negotiate with one another or the

²⁹ In chapter 4, it was described how users of Dspace debated extensively as to whether they should ask for help.

tutors as to what they could use; they were not instructed towards or restricted from any type of device. Again, as in the previous setting, the infrastructure provided in Cspace along with the existing culture of practice seemed to have contributed to the creation and smooth realisation of this phenomenon.

To illustrate this '*moving between technologies*' some examples are provided. When working in groups for an assignment such as the software engineering project, students often used the SmartBoards to show, discuss and reflect on shared and private work content. Moreover, when students used Cspace fleetingly for their lunch break or for a coffee break between lectures, it was common to use Cspace's laptops to check their emails or catch up with Facebook updates. On these occasions, one of the students usually turned on one of the laptops in the booth and the group took turns to use it. Furthermore, most of the students used the laptops and tablet-PCs already existing in Cspace – instead of their own – during initial phases of the software engineering project or for document production. As the students explained, the reason for this was because most of the templates for these documents were uploaded in the university server and could be easier to access through the spaces' infrastructure. In addition, the space's laptops contained software that enabled using the interactive features of the SmartBoard whereas if they used their own laptops they could share the content of their screens without being able to interact with it.

The interactive features of the SmartBoards (see Figure 6.6) were not used very often but, for particular tasks, students described them as "*quite useful and nice to have*". In particular, for document production and for study groups during the exam period students preferred to use the SmartBoards as their interactive features allowed them a range of interactions that would not have been available otherwise. These included: to underline and edit text while it was shared; to add hand-written

comments to the content of the display or write the solution to mathematical problems and then save the combined content as an image file to their personal devices.

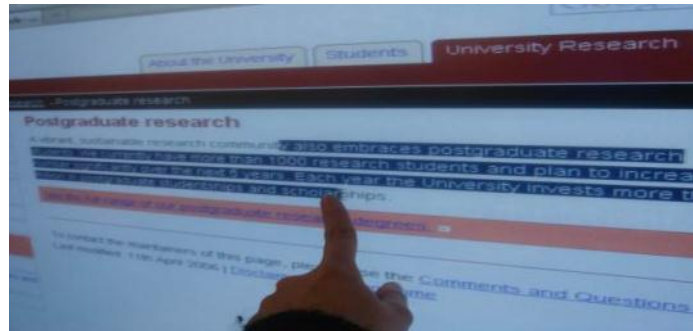


Figure 6.6. A demonstration of the interactive features of a SmartBoard

On the other hand, in later phases of their project assignment, groups tended to use their personal devices more frequently and Cspace’s laptops and tablet PCs less. A main reason for this shift was that students were often working on sections of the assignment at home individually and their personal devices carried the contents of this work. Students brought their devices in Cspace to show their individual work to the rest of the group and the tutors, to coordinate and discuss which sections needed further work and to carry on working during the session. In addition, in the later phases of the project, the students’ work involved a considerable amount of programming and debugging. For this activity, Cspace’s laptops and tablet PCs were considered by the students “very slow” and “severely underpowered (for computer science applications)” and as a result were not preferred.

Tutors’ approach

As mentioned earlier in section 6.2, an audio-visual monitoring system was added in Cspace after its launch to support formal learning sessions. More specifically, the system installed aimed to support the tutors in addressing the whole classroom, monitoring the students’ activities in each booth and being able to intervene if

necessary. Because of Cspace's unconventional seating arrangement, traditional ways of teaching³⁰ were not possible without the help of the technology. Technology was brought in to compensate for the tutor's lack of visibility of the groups in the booths, and for establishing their control and feedback to each of the groups. A form of videoconferencing software was used so the tutor could switch between seeing what was happening at each of the booths remotely on their screen and make comments to each group on what they were doing.

However, during the study, the tutors were never seen to use this particular technology. Instead, they walked around the booths to chat with the students, answer questions and provide feedback to their progress. Doing this took longer in time but the students used the waiting time to continue working on other parts of the assignment, to discuss issues that they had stumbled upon, to research possible solutions to problems, to decide on the questions they had for the tutors. One example from the fieldnotes illustrates this. On one occasion, at the very first practical session, a group of four students was observed to familiarise themselves with the problem space while waiting for the tutor to provide further guidance. The tutors had instructed all the groups to upload the documentation of the assignment on the SmartBoard and read through it. In the particular group observed, one of the students read the problem (assignment requirements) out loud while the rest of the group listened. Occasionally, the 'reader' would pause and address the others about a specific requirement "*Has anyone worked on anything similar before?*" or comment on his experience "*I have worked with Visual Studio in the past for another course assignment...*". They also used online search engines to research parts of the problem that were unfamiliar or unclear to them. During these interruptions the group engaged

³⁰ 'Traditional ways of teaching' refers to the way a teacher/tutor/lecturer would address and instruct their audience in a typical classroom/lecture theatre layout.

in discussion, slowly built an understanding of the problem and sketched an initial division of labour for the assignment. When the tutor arrived at their booth, she provided a more detailed description of the specifics of the problem and answered the students' questions. She also asked clarification questions to identify whether the group had understood what was expected to do.

When the researcher asked the tutors why they did not use the dedicated monitoring and facilitating system, various responses were provided. For example, one of them claimed that it was *"too much of a fuss"* to set it up and it was *"not worth the trouble"*; the other one said that she preferred a face-to-face interaction with the students as to her *"it was more suitable for this type of work and also much more meaningful"*.

6.4.4 Patterns of collaboration: transcending booth limitations

The analysis of Cspace in this chapter has demonstrated several kinds of smooth transitions between the student's interactions when working and socialising together. Their collaborations were supported occasionally by the design of Cspace and occasionally despite of it. Students collaborated in a variety of ways, both within the booth and across booths; most importantly these collaborative configurations happened intuitively and effortlessly.

In most cases students were observed collaborating in pairs. The booth layout promoted such pairings to occur; either the physical proximity or the face-to-face communication enforced by the couch seating or better the combination of the two. For example in a group of four students sharing one booth, the two students on one side of the booth often worked with each other and not with the person sitting across from them. On such occasions, it was also frequent for them to share one laptop and a notepad or alternate between using one and other's laptops (see (1) and (2) in Figure

6.7). Although more rare, students worked in pairs across the two sides of the booth, vertically or diagonally (see (3), (4) and (5) in Figure 6.7). On both these occasions students used either the SmartBoard to acquire a shared view of the task or document at hand (see (4) in Figure 6.7); or turned their screens for the other person to see/contribute to the task (see (3) in Figure 6.7). When a group bigger than two people was working together (and not in pairs as described previously), they would use the SmartBoard to share content with the rest of the group as in (6) in Figure 6.7.

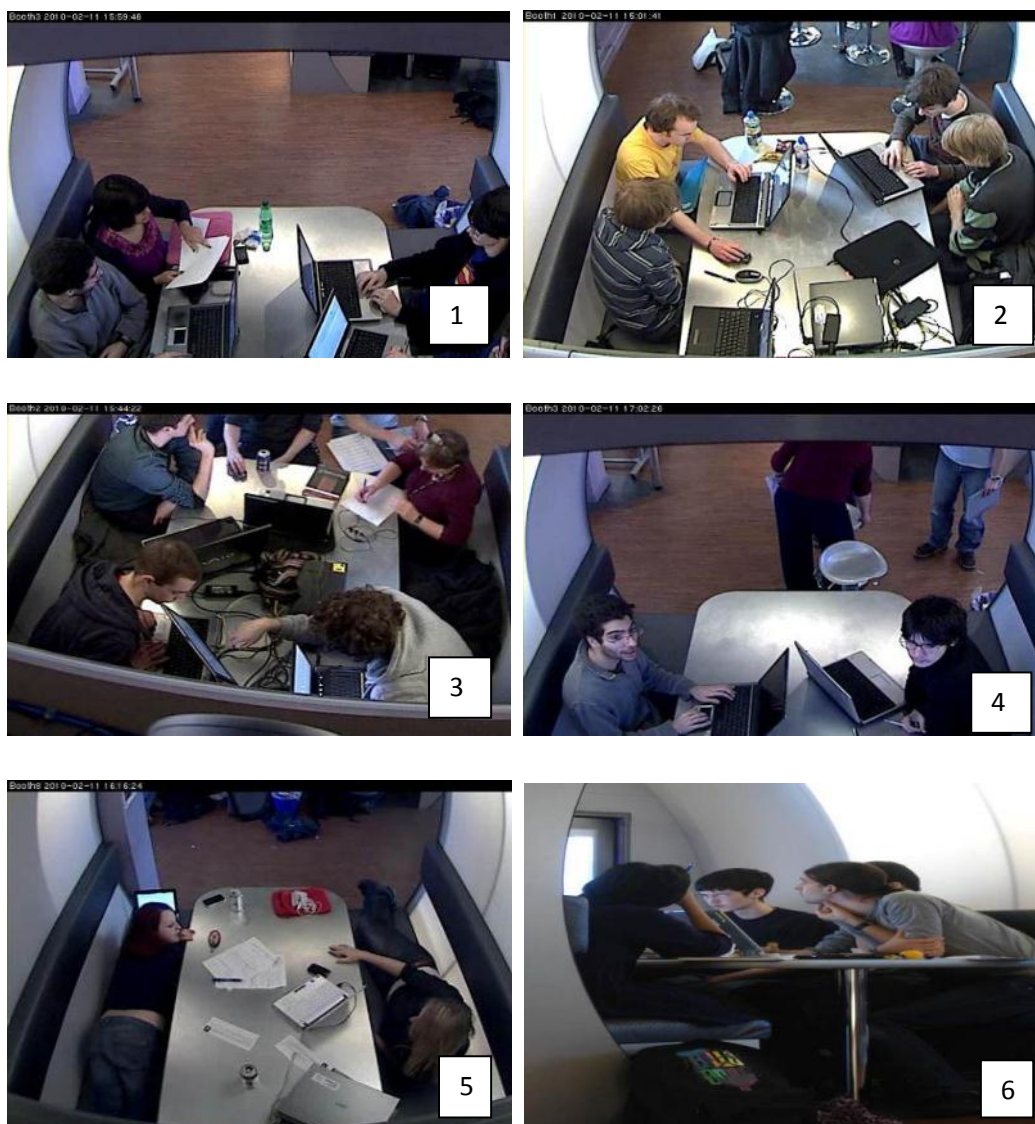


Figure 6.7. Patterns of collaboration: (1),(2) Students working in pairs side by side sharing one screen or alternating between monitors and notes; (3),(4),(5) students working in pairs across the

booth and either using the SmartBoard or turning their monitors; and (6) whole group collaboration while sharing information on the SmartBoard

While the booth design enabled within booth collaborations, it restricted across booths collaborations. Students couldn't interact with their peers unless they physically moved from one booth to the other. Still, students quite often did so. Members of one group or individual users visited the groups in the neighbouring booths (especially during the practical sessions). These visits most of the times were motivated by the need to request some information or clarification about a work related subject; however, as discussed in 6.4.2 they often triggered socialising or a fun break.

Furthermore, along with walking around the booths, students found other ways of transcending the restrictions of the booth design. During the study there was one incident where students instead of walking to each others' booth, were actually yelling to each other over them to communicate. It is possible that at first the students hadn't realised there were other students in Cspace and thought it was just them. At some point though, it was clear they were aware of the presence of others; the frequency of their yelling across booths reduced but did not cease. More specifically, the incident took place during the exam period at the first phase of the Cspace study and involved three post-graduate students, all working individually in separate booths adjacent to one other. They talked – and sometimes shouted - through the walls of the booth about a course-related problem, without leaving their booth. To achieve this, it took time and effort as often they couldn't hear each other clearly and they had to repeat more than once parts of the solution. Keeping the pace between all three of them also seemed to be a challenge and some of the repetitions were to make up for the catching up.

Another way to deal with the lag was to pause after every sentence to give time to the other two. Often, during these pauses, the person reading or one of the other two interrupted the process with a comment that was not related to the exercise. Usually these comments were jokes, gossips or mentions to something that the person had read or watched, such as funny video or a post on Facebook. Triggered by those comments the students would have a short or a longer break from their solution walkthrough. Similar to how the students worked within the booth, this group of students, while seating across three booths switched from working to having social breaks.

These examples illustrate how students worked together in Cspace in a variety of ways, accommodating the physical limitations imposed by the booth-like design. Students were comfortable working within the booth and equally comfortable working across the booths, when necessary.

6.5 Discussion

6.5.1 Actual versus anticipated use

Cspace was designed to support collaborative work among computer science students as well as:

- Teaching (formal and informal)
- Thinking (“*a quiet study area for individuals*”)
- Coding and testing
- Communication; as an area where informal *group discussion is facilitated (...)*

As described extensively in the previous sections, Cspace’s anticipated use was very much in line with its actual use. Students in Cspace worked collaboratively or individually on their assignments, browsed the web, attended teaching sessions, programmed and chatted online and/or with each other while eating and having coffee. Those activities took place seamlessly across and within the booths. with students and tutors going from/to one another, from/to personal and existing technological infrastructure, work and socialising, formal and informal learning and different collaboration styles. In more traditional teaching approaches, this constant moving between working and socialising could be considered as hindering or disrupting the flow of the learning process. However, in Cspace such changes occurred seamlessly providing a flow of a different kind. It seems that to a great extent, the booth-like design of Cspace enabled the co-existence of the various activities as well as the fluid transitions observed.

Cspace was meant to look like a diner and was identified as such by its inhabitants. As mentioned in section 6.2 the booth-like design of Cspace was inspired by the manager's memories of spending her undergraduate years working on group assignments in Pizza Express dining booths. The manager asserted that the booth design would better support group collaboration because of its intimacy and made sure to see this aspect was maintained in the final architectural design of the space. Compared with other lab areas or study rooms in the library (see Figure 6.8), food and drink consumption and the use of mobile phones was allowed in Cspace. Students quickly identified with this and appropriated the space as a diner/coffee place where they could either 'hang out', work or both. While eating and having coffee, students in Cspace surfed the web for work and social reasons using a variety of devices (tablet PCs, laptops, SmartBoards, smart phones). In Cspace, eating and drinking were closely associated with surfing the web or just being online. While no one (students or tutors) explicitly referred to Cspace as such, the activities that took place in an everyday context and how they co-existed (for a detailed description see section 6.4.1) demonstrated this kind of appropriation. In addition to what was observed to take place in Cspace, some of the students' statements from the questionnaires illustrate how they thought of Cspace very much to be like a diner or a coffee place. Specifically, in the section of the questionnaire where students were asked if there is anything they would like to add about Cspace³¹ several students replied "A coffee machine" or "Hot drinks vending machine" and one student wrote "A waiter, a menu".

³¹ This was the last question in the questionnaire and the exact phrasing was: "Anything you would like to add about Cspace?". A sample of the questionnaires can be found in Appendix 3.



Figure 6.8. Signs in different study spaces and labs forbidding drinking, eating and the use of mobile phones

The diner metaphor and booth-like design seems to have made a big impact in priming – and maintaining – diner-like behaviours; a casual eating and drinking coffee environment where people mostly came together to have a relaxed time. It also allowed for privacy while at the same time, intimacy. Similar to an actual diner, students seating in different booths could bond while enjoying their privacy. The booths provided an enclosed space that separated each group from the others physically. It is possible that this made the group feel protected from *outsiders* and, at the same time, promoted feelings of belonging-ness and commitment towards the group itself. Moreover, the seating arrangement – two couches facing each other – *constrained* the students to be intimate with those working in the booth; students had to share the table surface, squeeze next to each other on the couch while engaging in face to face communication. While this form of intimacy was occasionally found to act positively as a social catalyst for unacquainted students, at the same time it was shown that such a design required mechanisms that ensured private moments to the co-habitants of the booth. Privacy – or at least the sense of control over one’s private information – has been reported often as an important factor for the success of collaborative work and experience (Harrison et al., 2004; Metz Bemer et al., 2009).

Quite often, people working in groups or in a public setting wish to keep parts of their activities private; even more so in Cspace, where the physical layout (booth) imposed very close encounters. As described earlier, the technology in Cspace was often used for that role, to act as a shield for students' private communications and moments. The ability to shift with one keyboard stroke or with the unplugging of a cable from the publicly shared SMARTBoard to the private screen of the laptop enabled the swift and smooth transitions between private and public aspects, which in turn, were critical to a harmonious co-existence and collaboration between the group members.

Technology was further employed to make up for the limitations of the booth design. For one, it compensated – or better complemented – for the lack of mobility. The laptops provided in the space and the ease with which students could plug in their own devices offered portability and allowed students to move and work beyond the area of the booth. In terms of formal teaching, the lack of direct visibility to all booths had significant implications as the tutor could not be aware of the status of what each group was doing in their booths. Likewise, the students could not see and often could not hear the tutor and as a result they could not ask for help, or ask a question unless they were on the outer part of a booth. Interestingly, these limitations did not appear to affect negatively the fluidity of the interactions and the podium technology that was added to the space to overcome these limitations was not used.

Instead, the tutors walked around the booths and approached each group individually and the students worked on their own while waiting for the tutors to arrive. If they had used the monitoring system available, they could have finished their rounds faster or – even better – addressed only the groups that needed help. Other aspects of the teaching experience could have equally improved. For example, when tutors needed to address or make an announcement to the whole classroom, the

system would be ideal. Similarly, the tutor's notes and documents could be shared on the spot effortlessly by all booths with a single tap on the relevant command button. But the system was not used even for simple tasks such as these and yet no issues were observed being caused by its non-use.

A possible reason for this could be that, by the time the new system was installed, the tutors had already adjusted their teaching style to the design – and the limitations – of the booth. Also, such systems are often developed and used for teleconferencing applications, to support the communication between groups that are located in different cities or even countries. They are meant to compensate for groups not being able to meet in person and while they are increasingly being used in many settings, findings suggest that they cannot replace all aspects of the richness of face-to-face interaction (Heath and Luff, 2000; O'Hara et al., 2011). In Cspace, the groups and the tutor were in the same room, physically co-located, so it is possible that this kind of tele-conferencing system was redundant. Possibly some other device might have been more useful in supporting the particularities of Cspace's co-presence.

6.5.2 Sense of community

Some of the activities observed in Cspace could have equally been observed taking place in a coffee shop or a diner and that was partly what the inspiration behind Cspace was; yet, unlike diners and coffee shops where people who share the space but sit in different tables are usually unacquainted with each other, in Cspace most people knew each other or knew that they belonged to the same community. As a result, students in Cspace were comfortable walking around and sitting at other occupied booths to chat with others, ask for advice or help on an assignment; in a diner, similar behaviours would have been considered at least odd unless between friends. Still, not all students using Cspace were friends with one another; occasionally they were not

even acquainted with each other: for example, during the first day of the practical sessions, it was witnessed that members of several groups introduced themselves to one another. While boundaries between the private and public were still present, the social etiquette that Cspace afforded was different to that of a diner. In fact, it was observed that such boundaries – or the need for them – were more present within booths than across booths.

Cspace users were *inhabitants* of the space and developed a strong sense of community. It became a space that reified their everyday practices; their place to be. One potential reason for this might have been that the space's design had to some degree been shaped by the community that use it. The users – both students and tutors – had a say in the design through the survey and the focus groups that preceded and fed into the design of Cspace (see section 6.2). To this extent, Cspace agenda matched and supported the practices of its community. The fluidity of the collaborative patterns and transitions within Cspace was not just a result of the booth like design but also of the students' shared understanding of the ways in which this design could be appropriated.

Also, unlike a coffee shop or a diner, Cspace was *owned* by the students. Diners and coffee shops are open to the public. By open, we mean that – with the exception of issues of dress code and maybe some other owner-imposed rule – anyone who purchases a drink is welcome to sit there. In that sense Cspace was not like diners or coffee shops. Since its creation, Cspace was specifically a space for computer science students, engineering students and their tutors only. Having a keycard access door – similar to the one in Dspace – entrance was not allowed to students from other departments of the university. In reality though, Cspace had become a space for computer science students only. Soon after Cspace opened its doors, computer science students claimed ownership of the space at the expense of the engineering students. As

the director described: “Our [computer science] students often wrote on papers statements such as “STRICTLY COMPUTER SCIENCE” and “NO ENGINEERS ALLOWED” and stuck it on the door, which at first was just a tease between the students but slowly resulted in the engineering students coming in Cspace less and less”. As mentioned earlier, for computer science students, some of their courses involved using the space, whereas this was not the case for engineering students. The manager considered that, partly because of that, computer science students felt that Cspace belonged to them rather than the Engineering students. Consistent to this sense of ownership – and possibly relating to the fact that Cspace was located in the building of the Engineering department – computer science students felt strongly about advertising and claiming the space for themselves. By the time we visited and ran the study, Cspace was incontestably a computer science ‘turf’ and some of the tutors and the postgraduate students reminisced the director’s stories with a smile.

6.5.3 Summary of outcomes

The study presented in this chapter reports on the everyday use of Cspace, an innovative learning environment designed to support primarily collaborative work between students, as this was observed and experienced by the researcher and talked about by its users. The descriptions of Cspace’s everyday use answer the question of what takes place in this innovative learning space at an everyday context. Together with the descriptions from the other two studies, they provide an answer to the first research question (How do people interact with the architectural and technological infrastructure and each other in innovative learning spaces on an everyday basis?).

Further the discussion of this chapter contrasts the everyday use of Cspace with what was envisioned and anticipated by its managers and answers the second research

question (How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?). Findings have shown that the actual use in Cspace was for the most part in accordance with the visions and the expectations of its manager. The discussion in this chapter also begins to account for the potential reasons of this alignment between actual and anticipated use, as part of a framework that will satisfy research question 3 (How do we account for the differences between actual and anticipated use of the spaces?). The significance of a strong sense of community is pointed out as a major facilitating factor. Cspace's agenda matched and supported the practices of its community providing a sense of ownership among its users. This sense of community combined with the simple and legible technological and spatial infrastructure accommodated for the collaborative patterns observed and the fluid transitions between various coexisting activities. These issues of legibility and legitimacy are elaborated further as part of our framework in the Discussion Chapter of this thesis.

PART IV

DISCUSSION

Chapter 7

Discussion

Contents

7.1	Introduction	205
7.2	Tensions arising from the challenges of a multi-purpose agenda	207
7.3	A framework for supporting fluid transitions in innovative learning spaces	211
	7.3.1 Legibility	212
	7.3.2 Legitimacy and sense of ownership	214
	7.3.3 Customisation and appropriation	217
7.4	Three perspectives on the design and use of innovative learning spaces	222
7.5	Broader suggestions for the design of innovative learning spaces	226
	7.5.1 Involving the stakeholders in the design	226
	7.5.2 Post-occupancy studies	228
	7.3.1 Appropriate facilitation	229
	7.5.4 Simple infrastructure (Less is more)	231
	7.5.5 Prioritising the experience of one activity	232
	7.5.6 Community of users	233
7.6	Chapter Synopsis	234

7.1 Introduction

The aim of this work has been to provide a way to gain a deeper understanding of the everyday interactions that take place in innovative learning spaces and provide insights for future design. The following questions were set to inform our aims:

- How do people interact with the architectural and technological infrastructure and with each other in innovative learning spaces on an everyday basis?
- How do everyday interactions compare with those envisioned by the designers and managers of these spaces?
- How do we account for the differences between actual and anticipated use of the spaces?
- How can spaces be designed or recover from breakdowns so that actual and anticipated use (re) align?

Regarding the first two questions, chapters 4-6 of this thesis have provided detailed descriptions by means of ethnographic investigation of how three innovative learning spaces were used; and discussed how their use compared with what managers and designers of the spaces had envisioned. Chapters 4-6 have also initiated a discussion with respect to how we can account for the tensions between actual and anticipated use.

In this chapter, we review the differences between actual and anticipated use of the three settings and propose a framework that accounts for these differences and offers three factors that aim to sensitise and inform the design of innovative learning spaces. In section 7.4 we reflect on the broader socio-political context and the different perspectives offered in this thesis regarding the use and

design of innovative learning spaces. Finally, we provide some further suggestions for the design of innovative learning spaces.

7.2 Tensions arising from the challenges of a multi-purpose agenda

A particular focus of this work has been to compare the everyday interactions observed in each of the three innovative learning spaces (Dspace, Qspace, Cspace) with what was envisioned and/or anticipated by those who designed and managed these spaces. Identifying and explaining these tensions has formed the content of the study chapters. Before presenting the proposed framework that accounts for the tensions between actual and anticipated use, a brief review of those is provided in this section.

As described extensively in the previous chapter, Cspace's anticipated use corresponded with its actual use. Cspace was designed to support collaborative work among computer science students as well as a number of other activities: teaching, coding and testing, individual study, informal communication and socialising over food and refreshments. Our studies showed that students in Cspace worked collaboratively or individually on their assignments, browsed the web, attended teaching sessions, programmed and chatted online and/or with each other while eating and having coffee. Those activities took place seamlessly across and within the booths with students and tutors going from/to one another, from/to personal and existing technological infrastructure, work and socialising, formal and informal learning and different collaboration styles. Cspace was designed to look like a diner and was identified as such by its inhabitants. The booth-like design encouraged collaboration, primed and maintained relaxed diner-like behaviours, allowed for privacy and intimacy but also went beyond the etiquette of a diner as its users took ownership of the space.

The shared SmartBoards supported collaboration by allowing students to share their work and ideas while the laptops, tablet pcs and the feature of plugging personal devices offered portability. The technological infrastructure was also found to allow – along with the physical setup – for transitions between private and public to take place fluidly.

In Qspace actual use was found to be different to anticipated use. Qspace was designed to foster and inspire creativity and similarly to Cspace, it aspired to be a space that supports collaborative, experiential formal and informal learning activities. In Qspace however, those activities were envisioned to happen in a significantly more unconventional minimalistic space than Cspace. Qspace's unconventional design along with the managers' specific vision of creativity required considerable planning before it could be used and the university tutors were reluctant or unwilling to use it for their lectures and courses. As a result, activities of broader educational scope – different to the ones anticipated – took place in Qspace such as the workshop and the Scrapbook event observed for this study. The rigidity of the managers' views on facilitation and creativity was further found to ensue various conflicts and tensions between the managers and the workshop organisers regarding its realisation. Likewise, during the event, various aspects of the unconventional design of Qspace were seen to clash with the participants' expectations or impede the use and appropriation of the technology.

Some creative expressions – that were closer to the anticipated use of Qspace – such as the writing on the walls were manifested but under particular circumstances. Sometimes they were engendered by the events' agenda (as in the scrapbook event) or it was a particular task (as part of the workshop) that

enabled the creativity. The facilitation of Qspace's physical and technological configurations was a strenuous pursuit of balancing the needs and expectations of managers, organisers and users that most of the times proved more hurtful than inspiring for creativity.

The actual everyday use of Dspace was found to be very different to that hoped for and envisioned by its managers. Dspace was designed to be a space where people would come to explore new ideas and knowledge regarding teaching and learning in an informal playful manner; try out new technologies; and serendipitously meet others with common interests and consider new collaborations. Dspace did not share Qspace's unconventional design or strict management, comprised a variety of technological devices and its furniture was more flexible than Cspace's (chairs and tables on wheels) yet, for the most part, Dspace was not used. And when it was, it was seen to be used primarily as a meeting space or a breakout room without any obvious playful exploration of ideas, nor experimentation with new digital technologies. First time users were confused as to what Dspace was meant to be used for and what they were allowed to do. This confusion was potentially due to a combination of the regular users' appropriation and the space's location in the library building, which is associated with a non-playful social etiquette of use.

Some of the technology in the space was used, though rarely, but its usage reflected the repurposing of the space as a meeting room or a break room: the desktop workstations were used to discuss work, to present slide presentations, to check emails or to browse online content while having lunch. Serendipitous acquaintances and collaborations did not take place, as Dspace could hardly afford the co-existence of people. The space being perceived as a non-public

space, together with it being a relatively small space, affected the coexistence of more than one group in the space.

Dspace, Qspace and Cspace were all innovative learning spaces sharing a multi-purpose agenda in which a number of activities were expected to occur in the same space and often at the same time with the support of the furniture (and physical layout) and the technological infrastructure. The evidence presented in this thesis has shown that it might be a big and difficult task, yet not an impossible one. A multi-purpose agenda is not problematic per se; given the mechanisms that support this multiplicity and consequently bridge actual and anticipated use are understood. Accounting for the differences between anticipated and actual use requires an analysis that goes beyond the arrangement of the flexible furniture and technologies. Instead, it requires an understanding of how fluid transitions are supported.

The analysis of Cspace showed that it is possible for one space to support a wide range of activities in the same space and at the same time. However, this was not achieved due to – or at least not only due to – its technological infrastructure and physical layout. Cspace's success was shown to be relating to how a number of transitions (e.g. from one activity to another, from work to socialising, from formal to informal, from private to public, from familiar to unfamiliar) took place fluidly. In Cspace, various activities from snoozing to being examined took place unobtrusively at the same time, students switched from socialising to working, from working privately to working in groups.

On the other hand, in the other two settings tensions often arose when transitioning from one to another. For example, in Dspace conflicts arose when people wanted to use the space for playful, informal activities, while other users

were using it for more formal activities (interview, work demo, etc). Even for less conflicting activities (concurrent informal meetings), people were seen to leave the space instead of co-existing and returning later when it was free. In Qspace, the minimal and unconventional design of the space, made it difficult for people to engage with the technology in the desired way as familiar devices were arranged and/or controlled in very unfamiliar ways.

7.3 A framework for supporting fluid transitions in innovative learning spaces

How can we account for, understand, and make practical use of the differing tensions in the three (distinctly different) settings? We do this via a framework that utilises three empirically grounded (in our ethnographic studies), emergent factors that mediate the way people interact and further support – or obstruct – fluid transitions in innovative learning spaces. These are valuable for the various stakeholders (policy makers, architects, designers, managers) of innovative learning spaces when thinking about the design of innovative learning spaces. These factors are:

- i) Legibility (infrastructural and social)
- ii) Legitimacy and sense of ownership
- iii) Customisation and appropriation

These are interdependent and need to be considered as such. The order they are presented indicates a hierarchy that is not strict but it is helpful to take into consideration. Customisation and appropriation depend to a great extent on notions of legitimacy and legibility. Accordingly, legitimacy and sense of ownership can be conditioned by legibility (infrastructural and social). These concepts and their interrelation are explained next.

7.3.1 Legibility

Legibility refers to whether people understand how they can use the space and its infrastructure (technological and physical), what kinds of activities can or are expected to take place in it. It is useful to think of legibility in two ways: *infrastructural and social*. These are interrelated.

Infrastructural legibility refers to whether technological devices or the furniture or the physical layout is arranged or positioned in such a way that it makes it clear for people to understand what it is for, i.e. its purpose and affordances. The spatial architectural setup and the technological artefacts in innovative learning spaces should be sufficiently visible and legible for users – and in particular newcomers – to approach and interact with, while at the same time provide extendable choices to those that have more advanced needs (see later customisation).

As shown in the study chapters and discussed earlier, the way devices or furniture were arranged in the three settings made it easy or difficult for users to understand how or even whether, they could be used. In Cspace the power sockets, the cabling and all the controls for using the laptops and the SmartBoard screens were visibly laid out on the tables of the booths.

In Qspace, in contrast, due to its minimalist unconventional design, the same infrastructure (power sockets, cables, controls) was hidden either behind the moving walls or under the floor tiles, which made it hard for people to find them and use them. The interface that controlled all the technological infrastructure of Qspace (lights, screens, projectors etc) was equally problematic as it was not a familiar off-the-shelf interface, making it difficult for anyone but the managers to use. Dspace, although not as unconventionally designed as Qspace, faced similar problems. The arrangement of the technology and the

interface that controlled it – both the input (game consoles, laptop, desktop) and output (projector screen, LCD screen) – confused the users and rendered potential interactions with the technology difficult. For these two cases, it seems that having one interface to control multiple functionalities goes hand in hand with poor legibility. However, legible is not only about visibility and simplicity, it is also about familiarity. A familiar design and layout, technological devices that users are familiar with can equally reinforce legibility. Too much familiarity though might limit users to established, familiar practices and obstruct innovative approaches to teaching and learning. In general, users need to be able to understand how to go about things.

The physical layout in the form of physical constraints can also allow for better legibility. Physical structures can encourage or hint on specific interactions. Hornecker and Buur, 2005 describe this as “*embodied constraints*” in their framework for Tangible Facilitation. Embodied constraints refer to the “*set up or configuration of space and objects*” and they can: “*ease some types of activity*”, “*limit what people do*” or “*provide implicit suggestions to act in a certain way*”. Hornecker suggests the usefulness of using such constraints to “*encourage or induce*” people to collaborate. An example of embodied constraints used to promote and support collaboration was the booth layout in Cspace. The booth design allowed and further encouraged for interaction and collaboration to take place. Another way to think about this is in terms of f-formation configurations (Kendon, 1990). What the booth design did is that it supported a variety of f-formation configurations to take place between the people occupying the booth, increasing the chances of them collaborating or merely interacting. This does not suggest that physical space determines behaviour; it simply says that there is an interplay between physical and social, which brings us to the notion of social

legibility.

Social legibility refers to how the social context or social cues can help people understand how to use and interact with the space and others. Social context, social cues and/or perceived social etiquette can support – or hinder – fluid transitions, hint towards or discourage specific activities and interactions. In Dspace, the way regular users used the space and the uncomfortable co-existence between unacquainted groups, gave newcomers the impression that the space was a meeting room that was private or needed booking to be used. Further, Dspace being in the library building and a library's social etiquette potentially conflicted with its playful, experimental agenda. Social cues, as discussed earlier, can be embedded in or implied by the architectural layout and the technological infrastructure. An example of this is Cspace's design³² based on a diner setting. Its booth-like design had strong associations with what it feels/means to be in a diner; a casual eating and drinking coffee place where people come together in a relaxed setting. As such it encouraged a wide range of interactions to take place without any conflicts.

Legibility both infrastructural and social is essential to encouraging interactions between people, technology and the space in innovative learning spaces and further to mediating fluid transitions. Legibility is the basis for appropriation and customisation and further contributes to notions of legitimacy.

7.3.2 Legitimacy and sense of ownership

Legitimacy refers to how the normative status regarding interactions in innovative learning spaces is conferred and established; and sense of ownership refers to whether and how people perceive they are allowed to interact and use

³² And also its name that pointed to a café.

the physical and technological artifacts. For people's interactional transitions to take place fluidly in innovative learning spaces, it was shown it is important that users have a sense of ownership or at least co-ownership on the space.

In Dspace, people were observed to be confused as to whether they were allowed to use the technology or other artefacts (lego, magazines, books) in the space or even the space itself. Dspace being located in the library building in combination with the positioning of technologies in the shelves might have led to playfulness and experimentation being interpreted by people as a non-legitimate use of Dspace given the typical etiquette of libraries. In general, and especially for newcomers, it was unclear what it was allowed or expected to take place in Dspace. While legitimacy was not clear among newcomers, the regular users of Dspace indicated a clear sense of ownership over the space. When conflicts of co-existence in the space arose, regular users were more likely to be the ones that would stay in the space either due to their knowing it was public and non-bookable or due to their being more acquainted and more comfortable with the space.

Notions of ownership and legitimacy regarding use of technology vary among places, private and public ones. For example, earlier in Chapter 2 it was reviewed how there were varying ways of granting access to the use of Wifi in coffee shops and people relied on social conventions to make sense of these (Sanusi and Palen, 2008). When legitimacy is unclear and individuals are unsure as to whether they are allowed to use a space or the technology in it, they will often conform to social norms or the closest appropriate etiquette. In this respect social and infrastructural legibility are central. As mentioned earlier for Dspace, newcomers were confused as to what Dspace was for and what they were allowed to do in it. It was partly based on social and infrastructural cues (e.g. the locked

door, the technology on the shelves, the private use established by its regular users) that they made inferences as to the use and legitimacy of Dspace which contributed to its mixed identity and tensions between actual and anticipated use.

Qspace was clearly regulated and to a great extent policed by its managers. As described in Chapter 5, the managers of Qspace were involved laboriously in each event from its planning to its realization. In this respect, they were the ones that primarily defined what was allowed to take place in Qspace for each event and their authority was hardly disputed. Negotiations about what was allowed - which often became conflicts - between the managers and the event owners and users were observed taking place in particular during the workshop event. The tight management and facilitation together with poor legibility and the fact that for each event there was a new set of users and event organisers made it very difficult for Qspace users to experience a sense of ownership over the space with clear implications on the appropriation, customization and use of the space (see next section). Health and safety issues regarding the moving of the walls and the cabling infrastructure of Qspace intensified the managers' facilitation and limited further the sense of ownership of the users or the event organisers. A mixed message was also delivered: the space was designed and advertised to be fully configurable by the users and for the users, creativity and freedom of expression were also principal to the space's vision and yet all these had to take place within very strict constraints that were set by the managers.

On the contrary, in Cspace, legitimacy was not problematic and people were seen to use the space and interact with each other with ease. For instance, all users of the space - even newcomers - were seen to plug and unplug their

personal or existing devices in the space without being concerned it was allowed or not and without asking anyone beforehand. The users were co-deciders and co-constructors of what it was allowed to take place and as such they had a strong sense of ownership over the space. The lack of legibility issues as well as the fact that the community of users was a coherent and well bounded group further contributed to Cspace being used as well as appropriated.

7.3.3 Customisation and appropriation

Customisation refers to providing the option for an artefact – or a space – to be adapted, appropriated by its users. Appropriation refers to how the users took the space and used it as their own. The studies showed that it is important for innovative learning spaces to provide customisable tools or infrastructure along with mechanisms that will allow for users to appropriate. However, there is a delicate balance to be handled when users are appropriating for their own rather than intended use.

Customisation and appropriation further depend to a great extent to the previous concepts of legibility and legitimacy. The less clear what is available and how and when and where are, the less likely users of innovative learning spaces are to appropriate. For example, in Qspace the poor legibility of the tailored control interface and the unconventional physical layout made it very hard for people to appropriate the technology in the space. Further, issues of legitimacy made it problematic for people to even use their own devices in the space. The negotiations, the planning, the safety regulations made it that spontaneous appropriation in Qspace was difficult, while in the workshop event, the meeting room next door was appropriated almost instantly by the same users. Upon entering the room, participants of the workshop sat around the table and plugged

their devices to the power strip underneath the table. Two of the members of the group further turned on the LCD screen facing the table and took turns in plugging their laptops to present slides and share ideas for the design process. It is not that appropriation was impossible in Qspace but it certainly required significant effort and hassle both from the users and the event organisers. An example of this for the workshop organisers was the extensive negotiations that took place for the keynote speakers to be allowed to plug their own devices in Qspace's infrastructure. The same happened for the choice of seating, and when it came to introducing new elements in the space (such as the tabletop surface), the organisers had to sort out themselves everything that was required for it to work.

In Dspace, users appropriated for their own use and needs rather than the intended ones. People had coffee and lunch and informal meetings but very rarely experimented with the technology in the space or interacted with people they did not already know or co-existed with others. The technological infrastructure did not invite great customisation to begin with as the set of activities that one could do was pretty prescribed. Also, issues with the legibility and the legitimacy of the space (mentioned earlier) impeded more creative or playful appropriations.

In Cspace, users appropriated the space both in the intended ways and also in ways that were not expected when it was designed. These unexpected uses (such as having a nap or being used as a meeting point for going on a date) were not relevant to the anticipated use of the space but at the same time they were not conflicting. The technology in Cspace was also appropriated by its users. They both used the existing set up of devices in the space and further added a number of other devices (personal ones) customising the existing infrastructure

to their needs. How people appropriated the technology in Cspace illustrates how it is important to start with legibility and then customisation and appropriation are more likely. The technology was visibly laid out and provided the basic tools (e.g. laptops, shared display) for those who just wanted to have a browse during lunch while at the same time there was infrastructure that allowed people to plug their own devices which addressed more advanced needs and tools.

How this framework relates to others in the literature

The above framework is descriptive, similarly to the ones mentioned earlier in the literature (see Chapter 2, section 2.2.3) and its application can complement the existing ones. Unlike the other three, our framework emphasises on interactions in the space and how the factors identified can be used to mediate those interactions.

Radcliffe's et al.'s framework (2009) identifies the value of stakeholders and having a shared understanding regarding design, which is in line with the findings of this thesis. Further, Radcliffe's framework is formed in an interrogatory style with a set of generic questions addressed to each of the stakeholders. The line of questioning is purposefully kept simple so that it is equally applicable to all, but this can lead to generic or aspired answers about design and use of learning spaces which – as our work has shown – can result in tensions between actual and anticipated use. To address this limitation, it is suggested that the questions provided by Radcliffe can be used complementary to our factors. Our factors can be used to narrow the focus of the questions by targeting specific aspects of design or evaluation. To take as an example one question from Radcliffe's framework '*What technologies were most effective at enhancing teaching and learning? Why?*', the term 'effective' is quite vague and can confuse the design or evaluation unless considered in more specific ways. By

thinking of '*effective*' in terms of promoting and supporting legibility (infrastructural and social), legitimacy, customisation and appropriation, the focus of the design is narrowed down and, in the case of evaluation, not only it is narrowed down, but also grounded in examples of actual use.

Similarly, our factors can complement the pedagogy-driven framework of Bielaczyk (2006). The Social Infrastructure Framework (SIF) suggested by Bielaczyk emphasises on the usefulness of considering aspects of learning design along with the cultural and social background of the learners. However, it is limited in a number of ways: i) focuses on the tutors' input for the design and evaluation with no mention to other stakeholders; ii) focuses on learning tools rather than learning spaces as a whole and iii) despite its popularity in the literature of designing and evaluating higher education innovative learning spaces, the framework itself has been formulated from K-12 classroom studies which have distinct differences to the spaces studied in this work (age, curriculum etc). In this respect, the approach our framework takes can contribute to Bielaczyk's framework by: i) considering the inclusion of other stakeholders, ii) considering the learning tools as part of the space and with respect to particular interactions. Further, the learning goals that the tutor considers/chooses from can be translated to activities and then facilitating those can be considered in terms of our three concepts. Our framework can also be complemented by the SIF framework; for example with respect to social legibility, the cultural identities of learners suggested by Bielaczyk can be considered to enrich or broaden our understanding.

Finally, the FELS framework (Pearhouse et al. 2009), as described earlier, categorises the existing evaluation work and metrics on the design of innovative learning spaces and shows the wide range of approaches that exist as well as the

ambiguity that might emerge in terms of the results of such evaluations if the lens is not clearly stated. While the FELS typology provides great insight as to the range of evaluation metrics that exist, as a framework it is more of a meta-framework that can be used to identify kinds of evaluations and their motivations rather than be used for the design and evaluation of innovative learning spaces, which is what our framework is addressing.

7.4 Three perspectives on the design and use of innovative learning spaces

In light of the findings from our studies and the literature reviewed, there emerge three strands, or perspectives, on the design and use of innovative learning spaces. These perspectives further inform our understanding of why tensions are likely to arise. The findings of our studies showed that often many aspects of the design of innovative learning spaces fall apart or prove inappropriate when it comes to actual use. Actual use as represented by the users' situated practices, needs and expectations portrays one perspective on the design of innovative learning spaces. This perspective was often found to clash with the design visions and expectations of anticipated use. Those design visions and expectations of anticipated use represent two more perspectives on the design and use of innovative learning spaces.

The first perspective relates to innovative learning spaces' design visions and expectations as expressed by HE advisors and specialists that are often involved in the policymaking and/or the task of assessing and producing guidelines for the design of such spaces. As presented earlier, their visions and expectations address the design and use of innovative learning spaces in rather vague terms (see chapter 1 and 2). For example, among Oblinger's guidelines for designing innovative learning spaces are: "*design spaces around people*", "*support multiple types of learning activities*", "*accommodate information technology*" (Oblinger, 2006), all of which are sound advice but hard to put into practice without further detail. How can we support multiple learning activities? What kind of activities can be supported simultaneously? How is information technology accommodated and what kind of technology will that be? These and

other similar questions need answers in order for such guidelines to translate to design. Equally, flexible and adaptable design and technological infrastructure were presented as main characteristics of innovative learning spaces in all such guidelines, but when it came to the actual detail it remained unclear for example how mobility (in the form of movable furniture such as chairs and tables on wheels) as a design feature can link to specific learning activities and the broader scope of the student-centered approach.

The second perspective is that of the actual managers and potentially designers of these spaces. Their interpretation of the existing trends and guidelines on innovative learning spaces along with their own visions and expectations are reflected in the design and the management of the spaces. Sometimes these interpretations and visions prove problematic. For example, in Qspace, the conversations with the managers both before and during the planning of the workshop revealed a rigid but not well defined vision of creativity with respect to learning. The vision included a '*thinking-out-of-the-box*' approach, which the unconventional design of Qspace addressed, but there was no consideration or continuity from this broad vision to learning activities or means to support it. Some ad hoc choices that were in line with what the managers considered appropriate and relevant to creative learning and teaching (writing on the wall, mood lighting) were made, and from that point on were followed rigidly for each event.

There is also the perspective of the users that is located in the situated needs, expectations and design interpretations of those who occupy and use these spaces. While these three perspectives are relevant, and to some extent overlapping, currently they are not aligned. It is important that designers attend to the specific context that shapes the everyday use and interactions in innovative

learning spaces and also acknowledge the particular impacts of a given socio-economic-political context to elaborate designs that are sensitive to these contexts. In the case of innovative learning spaces, the socio-political context can be educational policies and curricula, cultural or institutional values as well as funding allowance. Aspects of the design or its funding are sometimes tied to specific policy decisions that cannot be designed away or ignored, like the recent policy on school architecture (Booth, 2012). In this respect, when considering the design and use of those spaces, it is useful to include approaches that integrate or account for the socio-political context. Such approaches are described by Dourish and Bell (2011). Dourish and Bell focus on issues of infrastructure and suggest that given the ubiquitousness of technologies, infrastructures need to be treated as socio-political and experiential. Infrastructures are not just another layering where technologies can lie; technological infrastructure has to recognise the social meanings, norms and traditions that are mediated through infrastructures (architecture is a great example of this) and only through this sort of social sensitivity, it will be possible for technologies to become relevant and appropriate for existing practices.

Further, an alignment between broader policies, visions and expectations and local visions and expectations (such as the managers') for these spaces can be informed and achieved by understanding the specifics of everyday use. The HCI community is ideally placed to act as an intermediate. To investigate and communicate the desires and everyday practices of users and facilitate their translation into design requirements and/or guidelines. This thesis already provides an example of how encompassing an HCI perspective towards understanding of innovative learning spaces can contribute useful outcomes both with respect to their everyday use and to their design. Hopefully, more research

will be undertaken in the future towards this direction.

7.5 Broader suggestions for the design of innovative learning spaces

In section 7.3, we proposed that legibility, legitimacy, sense of ownership, customisation and appropriation need to be taken into consideration when designing for innovative learning spaces. They can support fluid transitions while people interact with each other, the space and the technology and in this way regulate tensions between actual and anticipated use. In addition to these three concepts, we offer some broader suggestions regarding the design of innovative learning spaces that have emerged from reflecting on the findings of this thesis within the broader context of HCI and innovative learning spaces.

7.5.1 Involving the stakeholders in the design

Involving the stakeholders is a key part in the design process and discussed thoroughly in the literature of innovative learning spaces (Oblinger, 2006; Radcliffe, 2009; Jamieson, 2005). However, in the settings observed, the users, as obvious stakeholders, were only once really involved in the actual design of the spaces. The obvious stakeholders are the users (students and tutors) and the managers of these spaces but it might be useful to look beyond these two and involve policy makers, university administrators and potentially others too in this discourse as they contribute to different stages of the decision making. In all three of our studies, managers of the spaces were central to their design and use. Managers are often responsible or co-responsible for the design of the spaces and further for its daily upkeep. That includes providing ways to ensure that things will run smoothly and the aims set for the use of the spaces will be fulfilled. Given this central role, managers have to be included in the design process from its beginning - as they were in our studies, and acknowledged as main stakeholders

Users of those spaces are primary stakeholders too. Understanding the users' needs, their existing practices, their expectations and feeding those to the design of spaces beforehand is essential to the success of such spaces. Cspace exhibits the value of including the users in the design requirements and Dspace shows how important it is to map this feedback in an appropriate way. This doesn't seem to happen very often. Both in the literature and in our studies, users' input is usually assumed or ignored or miscommunicated. HCI and Interaction Design have a long tradition of involving users into the design process and many examples of good design practice and results. It will be foolish not to introduce these in the design of innovative learning spaces. User centred studies that can be carried out beforehand and inform their design such as focus groups, interviews, surveys, questionnaires, participatory design or even ethnographic or observational in situ studies that will provide an understanding of existing practices and needs.

Also, from the three settings studied, only in the design of one was reported that there had been feedback or direct involvement of a professional designer. Cspace's design was consulted and some extent overviewed by an architect. In the other two settings, no mention of an architect, interaction designer, educational technologist or similar was mentioned. It seems that often it is up to the managers to decide about the spaces' design, the spatial and technological infrastructure and/or intervene at a post-occupancy level to balance or resolve potential tensions that have arisen and can jeopardise fluid transitions. While this can be understood from a cost-efficiency perspective, given the complexity of the interactional interdependences between architectural space, technology and people uncovered by this work, it seems crucial for other stakeholders to be involved in the design (and the evaluation of innovative

learning spaces). Some obvious ones in addition to the ones mentioned already would be architects, educational technologists, interaction designers or similar professionals with expertise in the field of HCI.

7.5.2 Post-occupancy studies

The design of innovative learning spaces is couched in formal metrics and procedures that are often quite specific but yet at the same time quite vague when it comes to how these spaces are actually being used. Involving all stakeholders and introducing the principles and/or methodological tools of user-centred design in the design of innovative learning spaces is a significant step towards successful spaces but more is required.

Tensions between actual and anticipated use can only be fully exposed, understood and addressed after the spaces have been designed. Unfortunately though, there is not enough qualitative investigation at a post-occupancy level to help balance whatever tensions might have arisen. Architects of such spaces only engage with assessments of structural integrity (e.g. if there is enough air, enough light etc) after the space has been designed (Boys, 2011). University authorities are equally focused on managerial, ergonomic and administrative metrics (Scottish Council, 2008; JISC, 2009) and it is only up to the managers' best judgement and intentions to go about regulating actual and anticipated use.

It is important that these tensions between actual and anticipated use are addressed and understood more systematically and to do this more in depth qualitative post-occupancy studies are necessary. As shown in this work, there are many factors that shape what takes place in these spaces and whether they are being used as anticipated. For example, Qspace's unconventional layout made it hard for people to interact with the space's technological infrastructure,

Dspace's library location along with the arrangement of its technology in shelves resulted in the space not being used as intended, the tutors' podium in Cspace proved redundant as tutors and students found ways to communicate without it. Our framework presented these factors in a structured manner that can be used both to account for tensions between actual and anticipated use, but also to consider re-alignments between the two with respect to the post-occupancy circumstances. For instance, in Dspace it was suggested how a more hands on facilitation approach could prompt more people to engage playfully with the space. Learning from detailed descriptions of use, situated/local moments and using those to balance existing tensions can be very powerful.

7.5.3 Appropriate facilitation

Throughout this thesis, facilitation was talked about and shown it had an impact on how innovative learning spaces were used. For instance, Qspace was overly facilitated to the extent of patrolling, while Dspace was suggested it required a more active approach of facilitation. Given the significance of facilitation, a number of questions arise. Do innovative learning spaces always need to be facilitated? Who (or what) is facilitating, what and who is facilitated and how is this happening? Going through the processes of design suggested above and taking into consideration the proposed concepts (legibility, legitimacy, customisation etc) can provide significant guidance regarding these questions.

Yet, it is clear that the answers to these questions are unique to each setting and should be considered in relation to its specific circumstances. Facilitation can take many forms; it can be infrastructural where physical and technological structures can encourage or enforce specific interactions (Hornecker and Buur 2005, Benford et al., 1999; Marshall et al., 2011) (see

legibility section); or it might involve behavioural change where people will be nudged or directed into engaging with specific activities (Kalnikaite et al., 2011); or it might mean that someone has to be present in the space at all times. In terms of cost this might not be possible but on the other hand, without facilitation, there is a chance people won't use the space or will use it sub-optimally. In Dspace, for example, the managers facilitated the use of the space in a way that involved substituting their presence with instructions and manuals with the further option of them being available to help out on request. However, several people who wished to use the technology in Dspace had trouble doing so, as the instructions deemed insufficient for providing guidance and people were hesitant to call the managers. Retrospectively, given the “*technophobic*” or ‘not particularly interested in technology’ community of users and the location of the space (library), Dspace could have benefited from a more active or continuous form of facilitation such as someone being present in the space to guide the users and in particular the newcomers. The role of the manager could have been simply having someone responding to newcomers’ insecurities and questions while boosting the enthusiasm of those who were eager to experiment with the technology as it was meant by the space’s agenda.

On the other hand, too much facilitation/mediation from the managers’ part can be equally harmful as it can take more the form of patrolling as in Qspace. To a great extent the managers’ viewpoint on facilitation and its application obstructed or restricted people’s interactions in the space. Similarly to Windschitl and Sahl (2002), where the teachers’ perceptions about technology were reflected in their introducing the technology to the classroom, it seems that the managers’ perceptions about Qspace’s agenda, architecture, technology and,

eventually, about its purpose influenced how they viewed and practiced facilitation.

Overall, this work has shown that considering how to best facilitate interactions in innovative learning spaces is vital. Facilitation can take many forms and link back to our framework concepts (legibility, legitimacy and sense of ownership, customisation and appropriation) as a means to re-align actual and anticipated use.

7.5.4 Simple infrastructure (less is more)

Beyond the importance of considering issues of legibility, legitimacy and customisation in the design of innovative learning spaces, a general disposition towards simplicity in terms of infrastructure proved beneficial. Both architecturally and technologically, a simple infrastructure was found more successful. Of course simple here can include previously discussed notions of legibility, such as familiarity and visibility. The simple – and rigid – booth design in contrast to the variety, mobility and configurability of the design and furniture in Dspace and Qspace proved better in supporting the multi-purpose vision of the space and innovative learning spaces in general. Similarly, basic and off-the-shelf technological devices (laptops, desktops) and configurations were found to be the most popular in all of our settings, while the multifunctional and tailor-made interfaces designed for Qspace, Dspace (for controlling) and Cspace (for monitoring) were rarely used.

Further, providing a simple and lightweight infrastructure that does not require special handling and people can use on their own can potentially prevent or minimise issues of health and safety, accessibility or other regulations that can add further restrictions and hurdles to how users interact with innovative

learning spaces. Some of these hurdles such as the health and safety issues in Qspace, are harder to overcome once a space has been designed; so being proactive sometimes pays off.

7.5.5 Prioritising the experience of one activity

Another thing that seemed to have contributed to the success of Cspace, compared to the other two settings, and might be a useful consideration for future innovative learning spaces is supporting at least one activity well.

Innovative learning spaces are meant and designed to support a number of varying activities often at the same time. As established, this can be quite hard to achieve, at least straight away. As with the adoption of new technologies, the multi-purpose nature of innovative learning spaces might take some time to be accomplished. What can help this process though is creating interactional hooks that will be used to build upon. It will help if the managers or designers of the space consider the activities they hope or envision to support, then chose one as the primary and make sure they create the conditions that will support this activity successfully. With appropriate prioritisation and implementation, this one activity can gather a significant number of users and create a momentum in its use or a *“honey-pot effect”* (Brignull and Rogers, 2003) for the rest of the activities to start happening. In a way this happened in Cspace, small group collaboration was well supported and once students started using the space for this purpose, it started being appropriated for other purposes too. Equally, one can imagine how in Dspace if people successfully engaged with playing Wii or other games, eventually it could evolve into serendipitously chatting about research or thinking about these technologies in terms of teaching, etc.

7.5.6 Community of users

In many instances, we have reported and stressed on how the social context has a central role in the ways innovative learning spaces are used. Earlier, we suggested how users (as principal stakeholders) need to be involved in the process of designing innovative learning spaces. Now, we wish to revisit and stress more specifically on the significance of a community of users in terms of social legibility and facilitation. For social cues to work (such as the diner paradigm mentioned in the section about legibility), they have to be understood and/or shared by the people who use the space. A coherent and bonded community of users is more likely to share such social understandings and practices. Further, the particulars of the technological infrastructure are often learned over time, as being part of its membership, *“the taken-for-grantedness of artifacts and organizational arrangements is a sine qua non of membership”* (Bowker and Star, 1999).

The case of Cspace, also showed how important is the community of users as a facilitation mechanism. Potential breakdowns were prevented and newcomers' queries resolved within the community, as most of the users were regulars in the space and in using the technology. Students became owners of the space taking on the facilitator's role themselves whenever necessary; often without even having to explicitly do so, just by leading by example. Contrarily, the regular users of Dspace were not *“gamers”* and did not tend to use the technology in the space so help and facilitation by proxy – similarly to what took place in Cspace – was not an option for Dspace.

7.6 Chapter Synopsis

In this chapter, we reviewed actual and anticipated use of the three settings that had been discussed in detail in chapters 4-6. Users of Cspace collaborated in a relaxed diner-like fashion, as had been intended with the design of Cspace. The unconventional design of Qspace coupled with the way in which the space was facilitated constrained actual use. Dspace was used as a meeting space or a breakout room without the playfulness and experimentation with technology that had been intended by its designers.

In order to make practical use of these tensions in the three (distinctly different) settings a framework empirically grounded in our ethnographic studies was developed. This framework elaborated three factors that mediate the way people interact and further support – or obstruct – fluid transitions in innovative learning spaces:

- i) Legibility (infrastructural and social)
- ii) Legitimacy and sense of ownership
- iii) Customisation and appropriation

We differentiated between three perspectives on the design and use of innovative learning spaces: i) design visions and expectations as expressed by HE advisors and specialists, ii) managers and designers, and iii) users.

Finally, we provided some concrete suggestions for the (re)design of innovative learning spaces that come from the analysis of the three innovative learning spaces included in our study, with supporting arguments from the literature: involving stakeholders in the design, post-occupancy studies, appropriate facilitation, simple infrastructure (less is more), prioritising the experience of one activity and community of users.

Chapter 8

Conclusion and Future Work

Contents

8.1	Conclusion	236
8.2	Limitations	241
8.3	Future work	242

8.1 Conclusion

This thesis has described how innovative learning spaces lie at the interface of learning activities, flexible architecture and technological infrastructure. Looking into how various off-the shelf technological devices are being integrated in one single space with the purpose of supporting a range of learning activities, collaboration and socialising and into how users appropriate them, is an essential activity to justify the costs – in terms of money, effort and time – of developing such spaces.

Three innovative learning spaces were investigated through an ethnographic approach that, following the analytic orientation of Lucy Suchman's situated action (2007), considered the situated interactions and juxtaposed anticipated versus actual use. The findings contribute to an empirically-grounded understanding of how innovative learning spaces are being used and appropriated on an everyday basis, which has implications for the (re)design of current and future innovative learning spaces.

The first research question was stated as:

- How do people interact with the architectural and technological infrastructure and each other in innovative learning spaces on an everyday basis?

The accounts in chapters 4-6 describe how people in these spaces engaged in collaborative and individual work, teaching and learning sessions and even eating and having coffee. The first key contribution of this thesis are the written ethnographies in chapters 4-6, which are the first known sustained academic investigations into describing and explaining the everyday use and interactions in innovative learning spaces.

The second research question was stated as:

- How do actual everyday interactions compare with those envisioned by the designers and managers of these spaces?

The focus in chapters 4-6 was on how the use of innovative learning spaces compared with what managers and designers of the spaces had envisioned at the time of designing and planning these spaces. Each space had a multi-purpose agenda that was successful at times and unsuccessful at others. The analysis of Cspace showed that it was possible for one space to support a wide range of activities in the same space and at the same time. However, its success was not only attributable to its technological infrastructure and physical layout. Accounting for the differences between anticipated and actual use required an analysis that went beyond the arrangement of the adaptable furniture and technologies to an understanding of how fluid transitions were supported. The tensions between actual and anticipated use revealed by the analysis, the situated nature of adaptable design, as well as the complex and contested processes through which interactions in innovative learning spaces are accomplished, adapted or superseded is the second key contribution of this thesis.

The third research question was stated as:

- How do we account for the differences between actual and anticipated use of the spaces?

As mentioned above, the findings of this work have pointed to the importance of supporting fluid transitions in innovative learning spaces. Chapter 7 presented three factors that are valuable for the various stakeholders (policy makers, architects, designers, managers) of innovative learning spaces to take into account during the design process, since they mediate the way people interact and further support – or obstruct – fluid transitions in innovative learning spaces.

These factors are:

- i) Legibility (infrastructural and social)
- ii) Legitimacy and sense of ownership
- iii) Customisation and appropriation

Further, three perspectives on the use and design of innovative learning spaces was identified and suggested as a source of tensions. These three perspectives were:

- i) HE advisors and specialists involved in the policymaking and/or the task of assessing and producing guidelines for the design of innovative learning spaces
- ii) Managers and designers of innovative learning spaces
- iii) Situated user needs

The final research question was stated as:

- How can spaces be designed or recover from breakdowns so that actual and anticipated use (re) align?

In order to make practical use of the differing tensions in the three (distinctly different) settings a framework empirically grounded in our ethnographic studies was developed in chapter 7. The framework elaborates the three factors (mentioned above) that mediate the way people interact and further support – or obstruct – fluid transitions in innovative learning spaces. The framework presents a coherent vocabulary that has a role to play in the design decisions relating to these spaces. By considering each of these aspects both before and after an innovative space has been designed, anticipated and actual use can be closely aligned. The framework also allows for tensions to be identified – as it was the case in our studies – and, accordingly, addressed. To provide an example, we take Dspace. It is suggested that for Dspace a re-alignment between actual and

anticipated use can be achieved first by addressing issues of legibility both infrastructural and social. Many different solutions can apply, but as always they bear different costs. A relatively cost-free step would be that the devices (consoles, mobile phones etc) are untagged, removed from the shelves and positioned on tables or anywhere else within reach of people. Accordingly, the interface that controls the gaming consoles, the projector and screens should be changed. Most people are familiar with the handling of such devices so it would be easier if they could be used in the way they normally are in other settings and not mediated by an unknown interface. An alternative would be, as suggested earlier, to have a facilitator present in the space until people (especially newcomers) familiarise themselves both with the space's vision and its infrastructure. Albeit this might be more effective, it is also more costly. With respect to social legibility, moving Dspace out of the library could resolve much of the confusion and the established appropriations that were observed in our study. However, same as with the facilitator, this is a costly solution. Removing the key card access door or organising regular playful, experimental sessions with various academic populations (different departments, students and staff etc) could be another way of increasing social legibility and also reinforcing the sense of community, particularly of those who wish to use Dspace as a creative play space.

In addition to the framework, Chapter 7 presents concrete suggestions for the (re)design of innovative learning spaces that come from the analysis of the three innovative learning spaces included in our study, with supporting arguments from the literature:

- i) Involving the stakeholders in the design
- ii) Conducting post occupancy studies

- iii) Appropriate facilitation
- iv) Simple infrastructure (less is more)
- v) Prioritising the experience of one activity
- vi) Community of users

The sensitising framework along with the broader set of concrete suggestions for design comprise the third key contribution of this thesis.

8.2 Limitations

The studies presented in this thesis are ethnographic. Ethnographies provide in-depth knowledge of specific contexts and situations. Innovative learning spaces and their users are not all the same and the interactions that occur in those spaces are highly situated. The framework to inform the (re)design of innovative learning spaces is grounded in the ethnographic accounts and its strength is that it provides general guidelines, as opposed to specific prescriptions. Any specific prescriptions taken from this work should be viewed with caution.

The framework presented in chapter 7 is sensitive to the *situated* nature of the interactions that take place in innovative learning spaces. An extreme view of this situatedness is that predicting interactions in settings other than those included in this study is impossible. However, the aim of the framework is not to account for, nor predict, every possible variation – whether architectural, technological or user-related. Rather, the framework is intended to propose general guidelines grounded in empirical evidence to inform the (re)design of innovative learning spaces. An evaluation of this framework and subsequent extensions and adaptations is suggested as one avenue of future work.

The analytic orientation selected, situated action, was not only appropriate to answer the research questions, but also served to differentiate this work from other studies of innovative learning spaces. It should be noted that situated action is, however, only one lens through which data can be collected and analysed. Through the lens of situated action, it was possible to investigate the social processes and sustain the framework with empirical evidence. It was not possible to evaluate which space was “better” than another space, or which technologies were better suited to the space than others.

8.3 Future work

Future work could extend the research in this thesis in the following ways:

1. The settings investigated in this work have been relatively small in size. As shown in the literature review in chapter 2, larger scale (whole buildings) innovative learning spaces do exist. A natural continuation of this work would be to expand the locus of the investigation to larger size settings.
2. Following from the previous, investigating the factors of the framework proposed in this work and whether and in what ways these fit and address larger scale settings would be an interesting challenge.
3. Longitudinal ethnographic studies tracing the development of spaces from inception to built environments in use. This approach could span years, identifying patterns of use over a longer period and monitoring changes in those patterns over time.
4. Evaluating the framework using two types of case studies: One case study could apply the framework during the design process of innovative learning spaces before they are built, while another could apply the framework retrospectively as a kind of post occupancy evaluation of innovative learning spaces. Applying the framework at the design stage would be evaluating whether it is useful for producing a successful innovative learning space. Applying the framework retrospectively would be evaluating whether the factors in the framework identify breakdowns in existing spaces and can suggest solutions. In both cases the following questions can be addressed: Is the framework complete? Are there any concepts that can be added? Is it useful to the stakeholders? Does it generate useful design ideas and solutions to breakdowns? Can the framework be used to predict which learning spaces will be useful and accepted by users? The results from these evaluations

could provide further/new insights and/or more detailed considerations for aligning actual and anticipated use of these spaces.

References:

- Academic Workspaces Project, <http://www.academicworkspace.com> , accessed on 10/01/2013.
- Adams, A., Coughlan, T., Lea, J., Rogers, Y., Davies, S. and Collins, T. (2011). Designing interconnected distributed resources for collaborative inquiry based science education. In: *ACM/IEEE Joint Conference on Digital Libraries*, 13-17.
- Agar, M. H. (1980). *The Professional Stranger: An Informal Introduction to Ethnography*. Academic Press Inc., London, UK.
- AlAgha, I., Hatch, A., Ma, L., and Burd, L. (2010). Towards a Teacher-Centric Approach for Multi-Touch Surfaces in Classrooms, In *Proceedings of the ACM International Conference on Interactive Tabletops and Surfaces 2010 (ITS 2010)*, November 7-10, Saarbrücken, Germany.
- Alexander, C. (1979). *The Timeless Way of Building*. Oxford University Press, New York.
- Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., and Angel, S. (1977). *A Pattern Language*. Oxford University Press, New York.
- Bachour, K., Kaplan, F., and Dillenbourg, P. (2008). Reflect: An Interactive Table for Regulating Face-to-Face Collaborative Learning. Springer, <http://www.springerlink.com/content/q85518635660432n>
- Bachour, K., Kaplan, F., Dillenbourg, P. (2010). An Interactive Table for Supporting Participation Balance in Face-to-Face Collaborative Learning, *IEEE Transactions on Learning Technologies*, vol.3 (3), p.203-213.
- Baker, D. (2011). *Why UK higher education institutions should invest in technology*. Retrieved May 2011, from The Guardian: <http://www.guardian.co.uk/higher-education-network/blog/2011/apr/18/higher-education-investing-in-technology?INTCMP=SRCH>
- Bansler, J.P. and Havn, E. (2006) Sensemaking in technology-use mediation: adapting groupware technology in organizations. *Computer Supported Cooperative Work* 15, 1 (2006), 55-91
- Baraldi, S. (2010). Making the Classroom a play-ground for Knowledge. In Makitalo-Siegl, Kaplan, Zottman & Fischer (Eds.) *Classroom of the Future: Orchestrating Collaborative Spaces*, p. 87-114, Rotterdam: Sense Publisher.
- Barrett, P., Zhang, Y., Moffat J., and Kobbacy, K. (2013). An holistic, multi-level analysis identifying the impact of classroom design on pupils' learning. *Building and Environment*, 59, pp.678-689.
- Becker, H. S., and Geer, B. (1957). Participant observation and interviewing: a comparison, *Human Organization*, 16(3), p. 28-32.
- Benford S., Bederson, B.B., Åkesson, K.P., Bayon, V., Druin, A., Hansson, A., Hourcade, H.P. Ingram, R., Neale, H., O'Malley, C., Simsarian, K.T., Stanton, D., Sundblad, Y., and Taxén, G. (2000). Designing storytelling technologies to encouraging collaboration between young children, *Proceedings of the SIGCHI conference on Human factors in computing systems*, p.556-563

- Bielaczyc, K. (2006). Designing social infrastructure: Critical issues in creating learning environments with technology . *The Journal of the Learning Sciences* , 15 (3), pp. 301 – 329
- Bly, S., Schilit, B., McDonald, D.W., Rosario, B. and Saint Hilaire, Y. (2006). Broken expectations in the digital home, In *Proceeding of CHI EA 2006*, pp. 568-573
- Boddington, A. and Boys, J. (eds). (2011). *Re-Shaping Learning: A Critical Reader*. Sense Publishers.
- Booth, R.,(2012, December 31). Michael Gove faces rebellion over no-curves school plans, Retrieved January 2013, from The Guardian: <http://www.guardian.co.uk/education/2012/dec/31/michael-gove-rebellion-no-curves-schools>
- Boys, J. (2011). *Towards creative learning spaces*. Routledge.
- Bowker, G. C. and Star, S. L. (1999). *Sorting things out: classification and its consequences*. Cambridge, Mass.: MIT Press.
- Bowker, G. C., Baker, K., Millerand, F., and Ribes, D. (2010). Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment, In Hunsinger et al. (eds) *International Handbook of Internet Research*, Springer.
- Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, p. 77-102.
- Brignull, H., and Rogers, Y. (2003). Enticing people to Interact with large public displays in public spaces. In *Proceedings of Ninth IFIP TC13 International Conference on Human-Computer (INTERACT'03)*, 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. In *Proceedings of Conference on Computer Supported Cooperative Work (CSCW 2004)*. Chicago, USA: ACM Press.
- Briones, C., Schieck, A., and Mottram, C. (2007). A socialising interactive installation for the urban environments. In *IADIS Applied Computing 2007*, Salamanca, Spain.
- British Psychological Society (BPS), (2009). *Code of Ethics and Conduct*, Retrieved from: http://www.bps.org.uk/system/files/documents/code_of_ethics_and_conduct.pdf
- Brown, B., Reeves, S. & Sherwood, S. (2011). Into the wild: challenges and opportunities for field trial methods, in *Proceedings of CHI 2011*, pp.1657-1666.
- Carroll, J., Howard, S., Vetere, F., Peck, J. and Murphy, J. (2002). Just What Do the Youth of Today Want? Technology Appropriation by Young People. Proc. 35th Annual Hawaii International Conference on System Sciences (HICSS'02), IEEE Computer Society, vol. 5.
- Chang, R. L., Stern, L., Søndergaard, H., and Hadgraft, R. (2009). Places for learning engineering: A preliminary report on informal learning spaces, *Research in Engineering Education Symposium*, Palm Cove, Qld.
- 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.

- Ciolfi, L., Fernström, M., Bannon, L.J., Deshpande, P., Gallagher, P., McGettrick, C., Quinn, N., and Shirley, S., (2007). The Shannon Portal installation: An example of interaction design for public places. *IEEE Computer*, July, p. 65 – 72.
- Clarke, L., and Hornecker, E. (2013), Studying Multimodal Interaction at an Interactive Museum Exhibit on SteamPower Locomotive. Work in Progress at TEI'13
- Clemmensen, T. (2004): Four approaches to user modeling - a qualitative research interview study of HCI professionals practice. *Interacting with Computers* 16(4). pp. 799--829
- Comber, C. and Wall, D. (2001). The classroom environment: a framework for learning. In C. Paechter, R. Edwards, R. Harrison & T. Twining (Eds.), *Learning, space and identity*. London: Paul Chapman Publishing
- Crabtree, A., Hughes, J.A., O'Brien, J. and Rodden, T. (2000). On the social organisation of space and design of electronic landscapes, *Techné: Journal of the Society for Philosophy and Technology*, vol. 5 (2), pp. 13-39.
- Crabtree, A. and Rodden, T. (2004) "Domestic routines and design for the home", *Computer Supported Cooperative Work: The Journal of Collaborative Computing*, vol. 13 (2), pp. 191-220.
- Crabtree, A., Rouncefield, M. and Tolmie, P. (2011) "The temporal order of work", *Ethnomethodology at Work*, pp. 91-108, Ashgate
- Davidson, C. (2011, April 28). *So last century*. Retrieved June 10, 2011, from Times Higher Education:
<http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=415941>
- Dillenbourg, P. and Jermann, P. (2010) Technology for Classroom Orchestration, In *M. S. Khine & I. M. Saleh (Eds) New Science of Learning: Cognition, Computers and Collaboration in Education* p. 525 – 552, Springer. Dordrecht.
- Dittoo, W. (2006). Seriously cool places: The future of learning-centered built environments, In: Oblinger, D. (Ed.) *Learning Spaces*. Boulder, CO: Educause.
- Dix, A. (2007). Designing for appropriation. Short paper, in *Proc. BCS-HCI 2007*, Vol. 2.
- Do-Lenh, S., Kaplan, F., Sharma, A., Dillenbourg, P. (2009). Multi-finger interactions with papers on augmented tabletops, In *Proceedings of the 3rd International Conference on Tangible and Embedded Interaction*, Cambridge, United Kingdom.
- Dourish, P. (2001). *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge: MIT Press.
- Dourish, P. (2003). The appropriation of interactive technologies: some lessons from placeless documents. *Computer Supported Cooperative Work* 12, 4 (2003), pp. 465–490.
- Dourish, P. and Bell, G. (2007). The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure in Everyday Encounters with Space. *Environment and Planning B* 34, 3, pp. 414--430.
- Dourish, P., Grinter, B., Delgado de la Flor, J., Joseph, M. (2004). Security in the wild: user strategies for managing security as an everyday, practical problem. *Personal and Ubiquitous Computing*, 8 (6), pp. 391-401

- Dudek, M., (2000). *Architecture of Schools*, Architectural Press.
- Edwards, B. (2000), *University architecture*. London: Spon Press.
- Fischer, K. (2005). Research into identifying effective learning environments. Evaluating quality in educational facilities, p. 159-167.
- Fischer, K. (2006). The New Learning Environment: Hybrid Designs for Hybrid Learning, In R. Donaldson (Ed.) *Education Futures, Public 2*, Woods Bagot, Melbourne, VIC.
- Fischer, T. P., and Hornecker, E., (2012). Urban HCI: Spatial Aspects in the Design of Shared Encounters for Media Façades. *Proc. of ACM CHI'2012*, pp. 307-316
- Flintham, M., Reeves, S., Brundell, P., Glover, T., Benford, S., Rowland, D., and Farr, J. R. (2011). Flypad: Designing trajectories in a large-scale permanent augmented reality installation. In *ECSCW 2011: Proceedings of the 12th European Conference on Computer Supported Cooperative Work, 24-28 September 2011, Aarhus Denmark* (pp. 233-252). Springer London.
- 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* (p.261-283). Dordrecht, The Netherlands: Kluwer Academic.
- Grinter, R., Edwards, K., Chetty, M., Poole, E., Sung, J.Y., Yang, J. & Crabtree, A., Tolmie, P., Rodden, T., Greenhalgh, C., Benford, S. (2009) "The ins and outs of home networking: the case for useful and usable domestic networking", *ACM Transactions on Computer-Human Interaction*, vol. 16 (2), No.8.
- Hammersley, M., and Atkinson, P. (2007). *Ethnography: Principles in practice* (3rd edition), London: Routledge.
- Harrison, S. and Dourish, P. (1996). Re-Placing Space: The Roles of Place and Space in Collaborative Systems, In *Proceedings of the ACM Conference on Computer-Supported Cooperative Work (CSCW'96)*, Boston, MA, p. 67-76.
- Harrison, A., Wheeler, P. and Whitehead, C. (2004). *The distributed workplace: Sustainable work environments*. London: Spon Press.
- Haue, J.B. and Dillenbourg, P. (2009). Do Fewer Laptops Make a Better Team?, In Dillenbourg, P., Huang, J., and Cherubini, M. (Eds.) *Interactive Artifacts and Furniture Supporting Collaborative Work and Learning*, p. 129-145, Lausanne: Springer
- Heath, C. (2006) Body work: The collaborative production of the clinical object., in *Practising Medicine: Talk and Action in Primary Health Care Encounters*
- Heath, C., and Luff, P. (1992). Collaboration and control: Crisis management and multimedia technology in London Underground line control rooms. *Computer Supported Cooperative Work*, 1, 69-94.

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

Heath, C. and vom Lehn, D. (2008). Configuring 'Interactivity' : Enhancing Engagement in Science Centres and Museums, *Social Studies of Science*, vol. 38:1, pp. 63-91

HEFCE, (2008) <http://www.hefce.ac.uk/learning/tinits/cet/> Accessed on 10/01/2013.

Hinrichs, U. and Carpendale, S. (2011). Gestures in the Wild: Studying Multi-Touch Gesture Sequences on Interactive Tabletop Exhibits. In *CHI'11: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 3023-3032.

Holleis, P., Schmidt, A., Drewes, H. Atterer, R. and Dollinger, P. (2010) Taking teaching beyond the classroom: pervasive computing technologies for the classroom of the future, In Makitalo-Siegl, Kaplan, Zottman & Fischer (Eds.) *Classroom of the Future: Orchestrating Collaborative Spaces*, p. 63-87, Rotterdam: Sense Publisher.

Hoppe, U. (2009). The Disappearing Computer: Consequences for Educational Technology?, In Dillenbourg, P., Huang, J., and Cherubini, M. (Eds.) *Interactive Artifacts and Furniture Supporting Collaborative Work and Learning*, p. 129-145, Lausanne: Springer

Horn M.S., Leong Z.A., Block F., Diamond J., Evans E.M., Phillips B.C., Shen C. (2012). BATs and APes: Designing an interactive tabletop game for natural history museums. In: *Proceedings of ACM Conference on Human Factors in Computing Systems (CHI'12)*. Austin, Texas: ACM Press

Hornecker, E. (2008). "I don't understand it either, but it is cool" Visitor Interactions with a Multi-Touch Table in a Museum. In *Proceedings of IEEE Tabletop 2008*, p. 121-128.

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)*, p. 537-547.

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.

Humphreys, L. (2005). Cellphones in Public: Social Interactions in a Wireless Era, *New Media & Society 7(6)*, p. 810-33.

Hunley, S., and Schaller, M. (2006). Assessing Learning Spaces, In Oblinger, D. (Ed.) *Learning Spaces*. Boulder, CO: Educause.

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

Intille, S., Larson, K., Beaudin, J., Nawyn, J., Munguia Tapia, E., Kaushik, P. (2005). A living laboratory for the design and evaluation of ubiquitous computing technologies. In *Proceedings of CHI Extended Abstracts*, pp. 1941-1944

Jamieson, P., (2005), Understanding a Happy Accident: Learning to Build New Learning Environments, Report of ECE Research Project on Learning Communities (TEDI, University of Queensland, 2005)

Jamieson, F. (2008), *Creating new generation learning environments on the university campus*, Woods Bagot Research Press.

Joint Information System Committee (JISC), (2006). Designing Spaces for Effective Learning. http://www.jisc.ac.uk/uploaded_documents/JISClearningspaces.pdf Retrieved on 20/01/2013.

Joint Information System Committee (JISC), (2009). JELS Project Final Report at www.jisc.ac.uk/media/documents/projects/jelsfinalreport30.06.09.doc Retrieved on 13/01/2013.

Jones, A.C., Scanlon, E., and Clough, G. (2013). Mobile learning: Two case studies of supporting inquiry learning in informal and semiformal settings, *Computers and Education*, vol. 61, pp.21-32

Kaplan, F. Do-Lenh, S., Bachour, K., Kao, G. Y., Gault, C., Dillenbourg, P. (2009) Interpersonal Computers for Higher Education, In Dillenbourg, P., Huang, J., and Cherubini, M. (Eds.) *Interactive Artifacts and Furniture Supporting Collaborative Work and Learning*, p. 129-145, Lausanne: Springer.

Kaplan, F. and Dillenbourg, P. (2010) Scriptable classrooms, In Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., and Fischer, F. (Eds.). *Classroom of the Future: Orchestrating Collaborative Spaces*. Rotterdam, p. 245-257, the Netherlands: Sense Publishers.

Kaplan, F., Son Do-Lenh, and Dillenbourg, P. Docklamp: a portable projector-camera system. In 2nd IEEE TABLETOP Workshop, 2007.

Kendon, A. (1990). *Conducting Interaction: Patterns of Behavior in Focused Encounters*. Cambridge: Cambridge University Press, 1990.

Kollar, I. (2010) Turning the classroom of the future into the classroom of the present, In Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., & Fischer, F. (Eds.). *Classroom of the Future: Orchestrating Collaborative Spaces*. Rotterdam, the Netherlands: Sense Publishers.

Learning Landscapes in Higher Education, <http://learninglandscapes.blogs.lincoln.ac.uk> , accessed on 20/01/2013.

Lignau, A. (2010). Designing tomorrow's classroom with today's teachers, In Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., and Fischer, F. (Eds.). *Classroom of the Future: Orchestrating Collaborative Spaces*, p. 199-215, Rotterdam, the Netherlands: Sense Publishers.

Liu, C.C. (2008) Beyond the ownership of handheld devices: active learning with ubiquitous learning minds, In *Proceedings Fifth IEEE Conference on Wireless, Mobile, and Ubiquitous Technology in Education*.

Liu, C.C. and Kao, L.C. (2007) Do handheld devices facilitate face-to-face collaboration? Handheld devices with large shared display groupware to facilitate group interactions, *Journal of Computer Assisted Learning*, 23, p. 285-299.

Long, P. and Holeton, R. (2009) Signposts of the Revolution? What We Talk about When We Talk about Learning Spaces, *EDUCAUSE Review*, vol. 44, no. 2, p. 36-49.

Luff, P., and Heath, C., (2001) Naturalistic Analysis of Control Room Activities, in *People in control : human factors in control room design* pp. 151-167

Luff, P., Heath, C., and Hindmarsh, J. (2000) *Workplace Studies: Recovering Work Practice and Informing Systems Design* Cambridge: CUP

- Lynch, K. and Markham, S. (2003). The winds of change: students' comfort level in different learning environments. *SIGCSE Bull.* 35, 3 (Sep. 2003), 70-73.
- Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., & Fischer, F. (Eds.). (2010). *Classroom of the Future: Orchestrating Collaborative Spaces*. Rotterdam, the Netherlands: Sense Publishers.
- Marshall, P., Morris, R., Rogers, Y., Kreitmayer, S., Davies, M., (2011). Rethinking 'multi-user': an in-the-wild study of how groups approach a walk-up-and-use tabletop interface, *Proceedings of the 2011 annual conference on Human factors in computing systems*.
- Margaryan, A., Littlejohn, A., Vojt, G. (2011). Are digital natives myth or reality? University students' use of digital technologies, *Computers and Education*, vol. 56, 2, pp. 429-440.
- McBrien, J., Cheng, R., & Jones, P. (2009). Virtual Spaces: Employing a Synchronous Online Classroom to Facilitate Student Engagement in Online Learning. *The International Review Of Research In Open And Distance Learning*, 10(3), Article 10.3.5. Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/605>
- 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.
- McGregor, J. (2004) Space Power and the Classroom, *FORUM*, 46(1), p. 13-18.
- Mellhuish, C. (2011). 'What do we know about the relationships between learning and space?' and 'What matters about space for learning?', In Anne Boddington and Jos Boys (Eds.) *Reshaping learning: a critical reader. The future of learning spaces in post-compulsory education*, Rotterdam: Sense Publishers
- Metz Bemer, A., Moeller, R. M. and Ball, C.E. (2009). Designing Collaborative Learning Spaces: Where Material Culture Meets Mobile Writing Processes. *Programmatic Perspectives*, 1(2), September 2009, p. 139–166.
- Millen, D. (2000). Rapid ethnography: Time deepening strategies for HCI field research. In *Proceedings of DIS 2000: ACM Conference on Designing Interactive Systems Conference*. Brooklyn, New York: ACM Press.
- Milne, A. (2006). Designing blended learning space to the student experience, In Oblinger, D. (Ed.) *Learning Spaces*. Boulder, CO: Educause.
- Minocha, S. and Reeves, A. (2010). Design of learning spaces in 3D virtual worlds: an empirical investigation of Second Life. *Learning, Media and Technology*, 35 (2), 111–137.
- Oblinger, D. (2005) Leading the Transition from Classrooms to Learning Spaces, *EQ (EDUCAUSE Quarterly)*, vol.28,(1), p.14–18, <http://connect.educause.edu/Library/EDUCAUSE+Quarterly/LeadingtheTransitionfromC/39902>
- Oblinger, D. (2006). (Ed.) *Learning Spaces*. Boulder, CO: Educause.
- 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. In *Proceedings of The 2008 ACM Conference on Computer Supported Cooperative Work (CSCW'08)*, San Diego, California.

O'Hara, K., Kjeldskov, J., and Paay, J. (2011). Blended interaction spaces for distributed team collaboration. *ACM Transactions. Computer-Human Interaction*, 18(1): p. 1-28

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. In *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.

Paay, J. and Kjeldskov, J. (2005). Understanding situated social interactions in public places, In *Proceedings of INTERACT 2005*, Rome (Springer, Berlin), p. 499- 509.

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. In *Proceedings of CHI '08: Conference on Human Factors in Computing Systems*. Florence, Italy: ACM Press.

Plowman, L., Rogers, Y. and Ramage, M., (1995). What are workplace studies for?, In *Proceedings of the fourth conference on European Conference on Computer-Supported Cooperative Work*, pp.309-324, September 10-14, Sweden.

Preece, J., Rogers, Y., and Sharp, H. (2011). *Interaction Design*, Wiley & Sons; 3rd Edition.

Radcliffe, D. (2009). A Pedagogy-space-technology (PST) framework for designing and evaluating learning places. In D. Radcliffe, H. Wilson, D. Powell, & B. Tibbetts (Eds.). *Learning spaces in higher education: Positive outcomes by design*. Brisbane, Qld: The University of Queensland and the Australian Learning and Teaching Council.

Reeves, S., Benford, S., O'Malley, C., and Fraser, M., (2005). Designing the spectator experience, In *Proceedings of the SIGCHI conference on Human factors in computing systems*, April 02-07, 2005, Portland, Oregon, USA

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

Rogers, Y., Connelly, K., Tedesco, L., Hazlewood, W., Kurtz, A., Hall, B., Hursey, J., Toscos, T. (2007). Why It's Worth the Hassle: The Value of In-Situ Studies When Designing Ubicomp. *UbiComp 2007 Proceedings*. pp.336-353.

Rogers, Y. (2011). Interaction design gone wild: striving for wild theory. *Interactions*, 18:4, pp. 58-62.

- Salovaara, A. (2008). Inventing new uses for tools: a cognitive foundation for studies on appropriation. *Human Technology* 4, 2, p. 209–228.
- Sanger, J. (1996). *The Compleat Observer? A field research guide to observation*, Qualitative Studies Series 2, London: Falmer Press.
- Sanusi, A., & Palen, L. (2008). Of coffee shops and parking lots: Considering matters of space and place in the use of public Wi-Fi. *Computer Supported Cooperative Work*, 17, p. 257-273.
- Schatzman, L. and Strauss, A.L. (1973). *Field research: strategies for a natural sociology*. Prentice-Hall, Englewood Cliffs, N.J.
- Schratzenstaller, A. (2010). The classroom of the past, in Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., & Fischer, F. (Eds.) *Classroom of the Future: Orchestrating Collaborative Spaces*. Rotterdam, the Netherlands: Sense Publishers.
- Schwartz, B. (2004). *The Paradox of Choice: Why More is Less*. Ecco.
- Scott, S.D. (2003). Territory-Based Interaction Techniques for Tabletop Collaboration. In *Conference Companion of the ACM Symposium on User Interface Software and Technology UIST'03*, November 2-5, 2003.
- Scottish Funding Council. (2006). *Spaces for learning: A review of learning spaces in further and higher education*. Edinburgh, UK: SFC. <http://www.jiscinfonet.ac.uk/Resources/externalresources/sfc-spaces-for-learning>
- Shen, C., Ryall, K., Florlines, C., Esenther, A., Vernier, F., Everitt, K., Wu, M., Wigdor, D., Ringel, M., Hancock, M., and Tse, E. (2009). Collaborative Tabletop Research and Evaluation, In Dillenbourg, P., Huang, J., and Cherubini, M. (Eds.) *Interactive Artifacts and Furniture Supporting Collaborative Work and Learning*, p. 129-145, Lausanne: Springer
- Shepherd, J., (2007, July 10). Comfort zone. Retrieved March 2013, from The Guardian: <http://www.guardian.co.uk/education/2007/jul/10/highereducation.students?INTCMP=SRCH>
- Siddall, S.E., (2006). The Denison Learning Space Project, Mission and Guiding, <http://www.denison.edu/academics/learningspaces/checkl.pdf> .
- Sims, R. (2003). Promises of Interactivity: Aligning Learner Perceptions and Expectations With Strategies for Flexible and Online Learning, *Distance Education*, Vol. 24, (1).
- Spaces for Learning Project, <http://arts.brighton.ac.uk/research/cetld/learning-through-the-design-process/learning-spaces> , accessed on 15/01/2013.
- Spradley, J. P., (1980). Participant Observation. Orlando, Florida: Harcourt College Publishers. pp. 58–62.
- Star, S.L. (1999). The Ethnography of Infrastructure, *American Behavioral Scientist*, 43, p.377-391.
- Strange, C.C., and Banning, J.H. (2002). *Educating by Design: Creating Campus Learning Environments That Work*. San Francisco: Jossey-Bass.
- Suchman, L. (2007). *Human-Machine Reconfigurations: Plans and situated actions (2nd edition)*. Cambridge University Press.

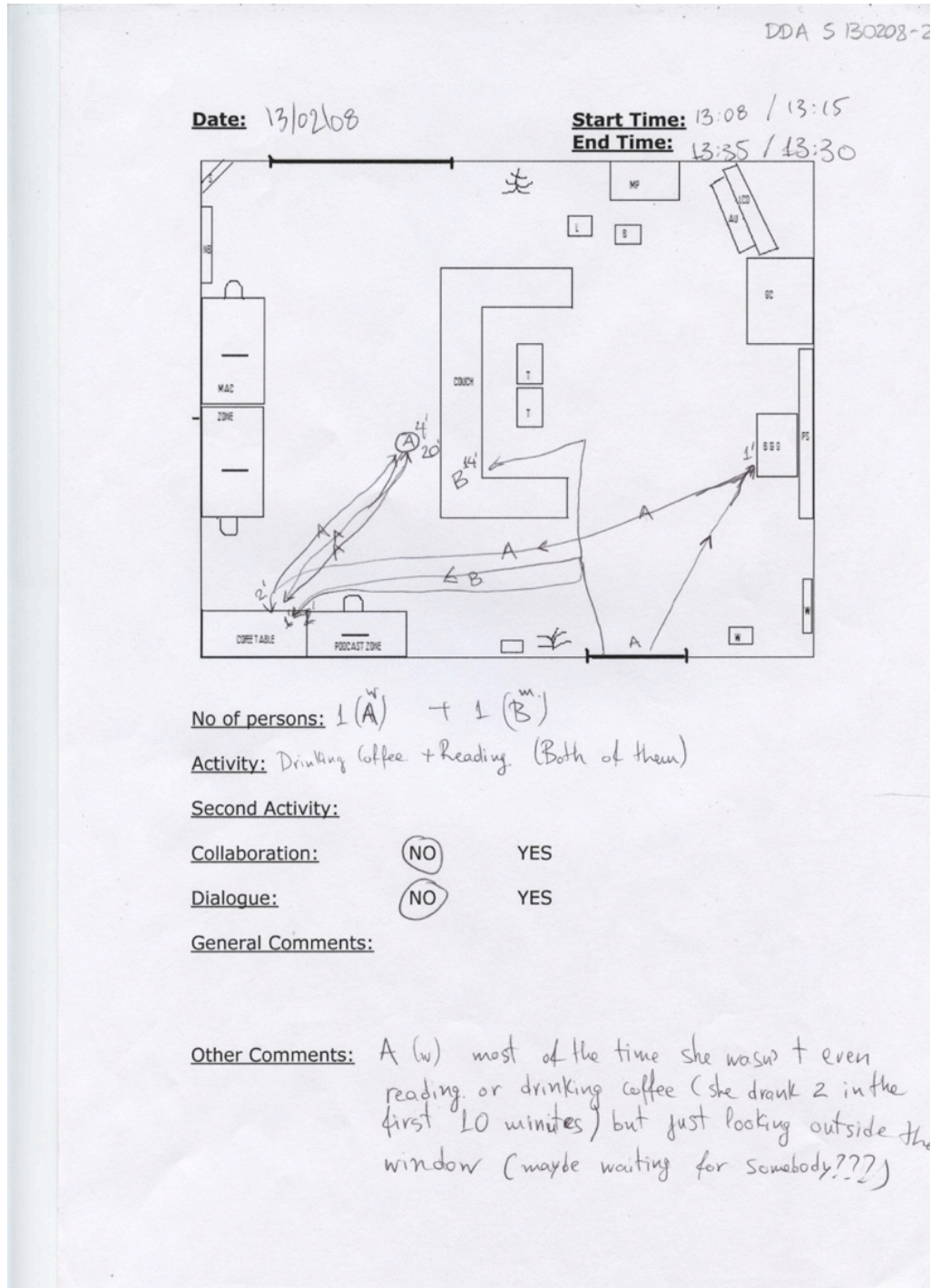
- Suchman, L. (2011, March 31). Restoring Information's Body. Milton Keynes: Open University (Keynote Speech).
- Sutherland and Sutherland (2010) In Mäkitalo-Siegl, K., Zottmann, J., Kaplan, F., & Fischer, F. (Eds.). (2010). *Classroom of the Future: Orchestrating Collaborative Spaces*. p. 41-63, Rotterdam, the Netherlands: Sense Publishers.
- 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.
- Temple, P. (2007). *Learning Spaces for the 21st Century*. Higher Education Academy.
- Temple, P. (2008). Learning spaces in higher education: an under-researched topic, *Review of Education*, v.6 (3), p.229-241, London.
- Temple, P. (2009). From Space to Place: University Performance and its Built Environment, *Higher Education Policy* 22, p. 209–223
- Tolmie, P., Crabtree, A., Egglestone, S., Humble, J., Greenhalgh, C. and Rodden, T. (2010). Digital plumbing: the mundane work of deploying ubicomp in the home, *Personal and Ubiquitous Computing*, vol. 14 (3), pp. 181-196.
- Van der Linden, J., Johnson, R., Bird, J., Rogers, Y., and Schoonderwaldt, E., (2011). Buzzing to play: lessons learned from an in the wild study of real-time vibrotactile feedback. In: *Proceedings of the 29th International Conference on Human Factors in Computing Systems*, 07-12 May 2011, Vancouver, BC, Canada.
- Van Note Chism, N. (2002). A Tale of Two Classrooms, In Chism N. and Bickford, D. (Eds.) *The Importance of Physical Space in Creating Supportive Learning Environments. New Directions for Teaching and Learning*, No. 29, San Francisco: Jossey-Bass.
- Van Note Chism, N. (2006). Challenging Traditional Assumptions and Rethinking Learning Spaces, In Oblinger, D. (Ed.) *Learning Spaces*. Boulder, CO: Educause.
- Watson, L. (2007a). Building the Future of Learning. *European Journal of Education*, 42 (2), p. 255-263.
- Watson, L. (2007, March 20). *School buildings must be our flexible friends*. Retrieved January 2013, from The Guardian: <http://www.guardian.co.uk/education/2007/mar/20/elearning.technology6?INTCMP=SRCH>
- Weiser, M., (1991). The computer for the 21st century, *Scientific American*, 265, pp. 94-104.

Appendices

Appendix 1: Dspace Sociograms

This appendix is referred to in Chapter 4, section 4.3.2. It includes six sociograms capturing the current activity different observational sessions in Dspace

Sociogram 1



Sociogram 2

DDA S-130208-1

Date: 13/02/08 **Start Time:** 12:50 **End Time:** 13:09

No of persons: 2 (A + B) / at 13:00 C
women man

Activity: B playing with the robot, A ~~playing LEGO~~ observing, talking to B

Second Activity: Meeting more like a ~~(casual-break)~~

Collaboration: NO YES

Dialogue: NO YES

General Comments: A took the lego but did not play at all (Why B played with the robot for 5 minutes and probably would play more but I think she felt embarrassed or exposed.)

Other Comments:

Sociogram 3

DDA S 030308-1

Date: 3/3/2008 **Start Time:** 13:29 // 13:34
End Time: 14:10 // 13:45

No of persons: 2 (A and B) // 2 Cf and Dp

Activity: (Job) Evaluation // Interview // Meeting
 (recommendation phase)

Second Activity:

Collaboration: NO in a tech way YES // NO in a tech way

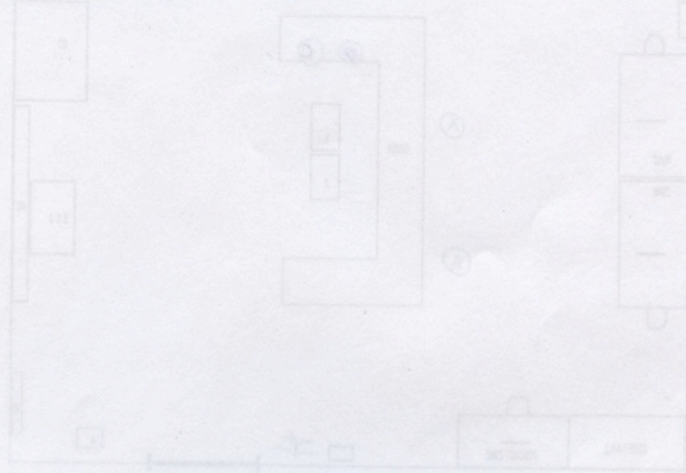
Dialogue: NO YES // YES

General Comments: Talking softly. A was taking notes in his laptop all the time. Although he had the laptop, he didn't use it with the table. // Talking very softly because the interview taking place. They kind of cornered up and didn't stay long for the same reason.

Other Comments: Great distance between them as far as seating is concerned. // One of the two was the person who first (200,000) suggest doing/creating the ~~thing~~ and was explaining to the other how ~~it~~ became true.
 [purpose of this is to demonstrate, create, have] informal meetings harbor technology

Most of the things are "placed" like that because the architect designed them like that

Library was neutral that why it was chosen. If it happened in a department people will feel strange like invaded in another persons office/department



(Faint, mostly illegible handwritten notes and survey data)

Other Comments: ...

General Comments: ...

Diagnosis: ...

Collaboration: ...

Second Activity: ...

Activity: ...

No. of persons: ...

Sociogram 4

DDA S 10/3/08 - 1

Date: 10/3/2008 **Start Time:** ~~14:00~~ 14:00
End Time: 14:55

No of persons: 1 Cm

Activity: Podcasting / E-course

Second Activity:

Collaboration: NO YES

Dialogue: NO YES occasionally

General Comments: using camera, earphones (audiovisual material), watching other-side camera, listening to what the other side has to say, writing text on Mac as answers, taking written notes and laptop notes

Other Comments:

Sociogram 5

DDA S 100308-2
(Amber's chair)

Date: 10/3/2008

Start Time: 14:15 // ~~16:00~~

End Time: 14:25 //

No of persons: 2 A B // Cm (see previous) //

Activity: Talking (usual meeting) // podcasting (see previous)

Second Activity:

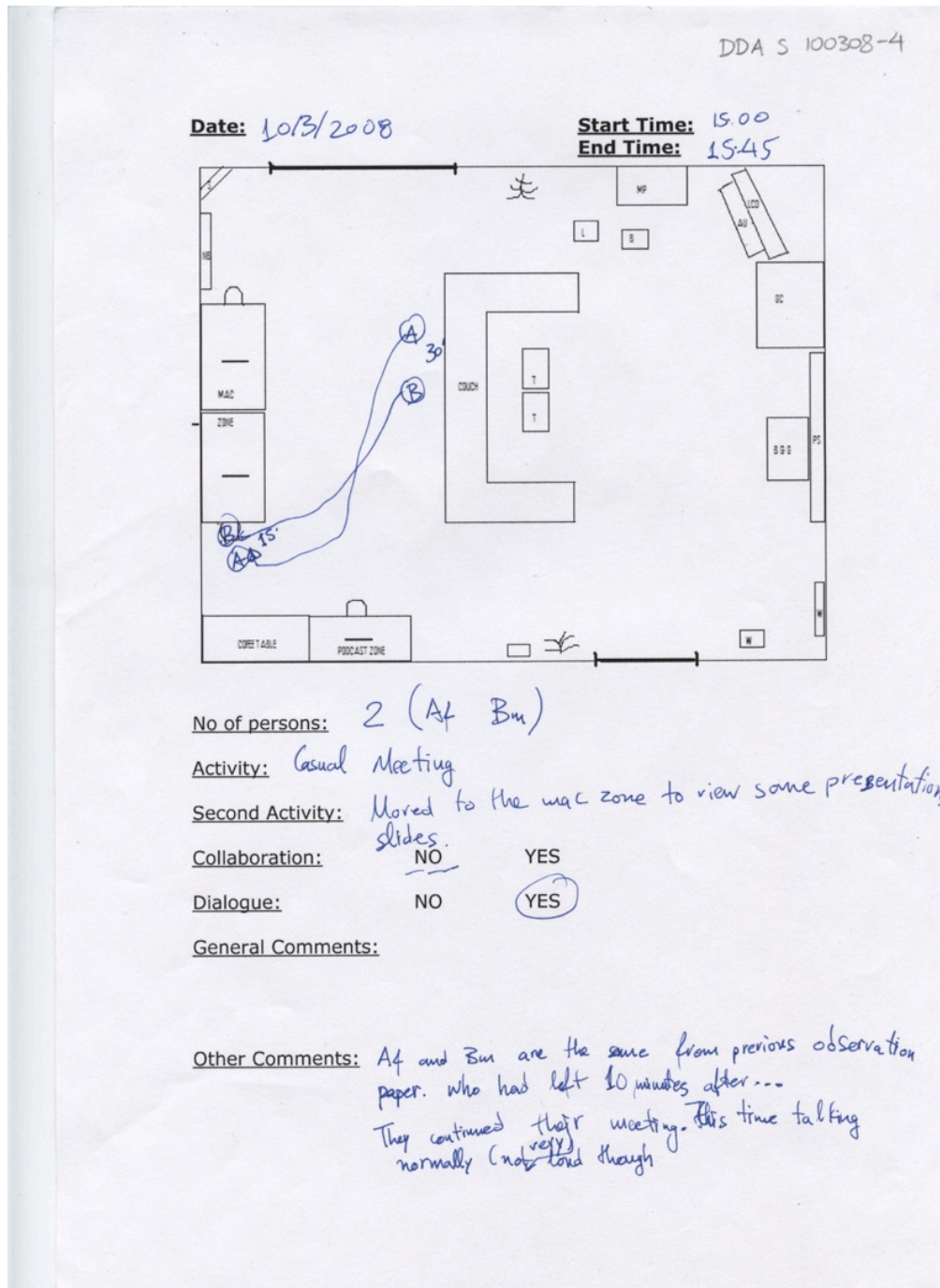
Collaboration: NO YES

Dialogue: NO **YES**

General Comments:

Other Comments: Whispering, left after 10 minutes when they realised the other person was podcasting. A and B returned ^{in 10 minutes} as soon as Cm left. Continued on their meeting this time more normally (loudly) speaking.

Sociogram 6



Appendix 2: Records of email exchange for the workshop event

This appendix is referred in Chapter 5, section 5.4.2. It consists of two (extended) email communications between the managers of Qspace and the organisers of the academic workshop.

Email communication 1: This chain of emails exchanged between the workshop organisers and Qspace's facilitators was forwarded to the researcher by one of the workshop organisers. It is indicative of the negotiations that took place for the planning of the event and how facilitation was pursued.

Hi nadia

this emmail thread should be interesting for you to read. It seems it is a nightmare to get anythign to work in the CETL. Not really allowing you to improvise!

[Name of organiser 1]

Anfang der weitergeleiteten E-Mail:

> Von: **[Name of Facilitator 1]** <facilitator@university.ac.uk>

> Datum: 20. August 2008 16:08:57 GMT+01:00

> An: **[Name of organiser 1]** <xxx@email.com>

> Kopie: "xxx-workshop@university.ac.uk"

> Betreff: Re: **[Name of workshop]**

>

> Hi **[Name of organiser 1]**,

>

> Doing a digital poster session would be great as long as it's

> planned far enough in advance. It's getting too near to the event

> to do a large digital poster session now. We would need to give

> people quite specific instructions as to the size and format of

> their posters, and they'd have to be single static images rather

> than powerpoint shows. I'd also need to do some additional

> formatting of the posters after receiving them and write a number

> of xml files to govern when the posters should appear and on what

> screens.

>

> I think we should be fine with what you've suggested, but I'm

> worried about the potential of people turning up on the day and

> there not being space to show their posters.

>

> We've found that the key to making things work in the CETL space is

> ensuring that we know exactly what needs to be shown where and when

> in good time before the event. This avoids disappointment for

> organisers and participants and unnecessary stress for us on the day.

>

> How many individuals projects are being presented? I can see that

> the email list has 30+ names on it, but I know that many of these

> are co-authors so won't want to show a separate demo or slide show.

> We only have 10 plasma screens and projectors can be quite

> problematic to use in market place style demo environments (which

> is what I'm gathering this will be).

>

> I'm actually on holiday at the moment but am keen to make sure that

> any additional information is sent out to participants in good

> time. I think we need to be clear that if they require use of a

> screen for the demo event they need to let us know in advance, even

> if they don't bring the content along until the day. Otherwise it

> will be impossible to plan what will be shown where.

>

> Thanks,

> **[Name of facilitator1]**

>

>

>

> **[Name of organiser1]** wrote:

>> Hi **[Name of facilitator1]**,

>>

>> actually **Name of facilitator2** had strongly encouraged us to do this kind of

>> digital poster session... So far there was only 3 or 4 people that

>> wanted to show videos.

>>

>> I've just sent off an email telling participants what they can do,

>> and indicating that ismple printed posters will be the easiest in

>> terms of setup...

>>

>> **[Name of organiser1]**

>>

>>

>> Am 20.08.2008 um 15:43 schrieb **[Name of facilitator1]**:

>>

>>> Ok. Can you tell me a bit more about what you're hoping for with

>>> the digital posters? Where are you hoping that they will show

>>> them? Do you know how many there will be and are you wanting them

>>> to all be shown at the same time?

>>>

>>> We had a digital poster session in there once before and it was

>>> very complicated. It took me a full day to set it up, which we

>>> don't have time for this time! But that was for about 30 posters,
>>> so hopefully this one won't be as complicated.
>>>
>>> They can send them directly to me. If they could put '**[Name of
>>> Workshop]** poster' in the title of the email that would be helpful.
>>>
>>> The format we choose will depend on how many there are and when/
>>> where you want them to be shown.
>>>
>>> Thanks,
>>> **[Name of facilitator1]**
>>>

>>> **[Name of organiser 1]** wrote:
>>>> **[Name of facilitator1]**,
>>>>
>>>> do you want to have people send you digital posters by email? It
>>>> might be easier if they go directly to you than if they first
>>>> send them to us and we forward it again ...
>>>>
>>>> digital posters are not the 1 minute thing. We'll put that
>>>> together ourselves, so it will be all one file.
>>>>
>>>> **[Name of organiser 1]**
>>>>

>>>> Am 20.08.2008 um 15:25 schrieb **[Name of facilitator1]**:

>>>>

>>>>> **Workshop participant 1** can either send/ direct us to a copy of his software

>>>>> before hand or we can try using his laptop.

>>>>>

>>>>> We could connect a laptop with two vga connections to two

>>>>> plasma screens as long as we used the plasmas in the entrance

>>>>> space which are close together.

>>>>>

>>>>> Are the digital posters the slides for the 1 minute

>>>>> presentations? I agree it might be worthwhile having these in

>>>>> advance to save trouble on the day.

>>>>>

>>>>> **[Name of facilitator1]**

>>>>>

>>>>> **[Name of organiser 1]** wrote:

>>>>>> I think **Workshop participant 1** has his own software, so we*d need to find

>>>>>> out whether that software would run on your system or whether

>>>>>> he can hook his laptop to two of the projections/monitors

>>>>>>

>>>>>> If you could send us any instructions that we should send to

>>>>>> our participants on what can easily be put on projectors and

>>>>>> data formats etc., that would be great.

>>>>>>

>>>>>> I guess they could send you the slides for their digital posters.

>>>>>>

>>>>>> If people come with a CD with their own software, we don't

>>>>> have any time to test - I guess most will arrive for the start
>>>>> of the workshop.
>>>>>
>>>>> **[Name of organiser 1]**
>>>>>
>>>>> Am 20.08.2008 um 15:09 schrieb **[Name of organiser 2]:**
>>>>>
>>>>>> Hi **[Name of facilitator1],**
>>>>>>
>>>>>> Thanks for this. Meeting on friday 8th from 10 - 1 should be
>>>>>> fine for most of us. I agree it'll be a good idea to sort
>>>>>> things out earlier rather than later.
>>>>>>
>>>>>> Some people have asked if they for demo space. Mostly this
>>>>>> seems to be to show some video. Here is a list of what people
>>>>>> have asked for - should we be giving them any specific
>>>>>> instructions re formats etc.
>>>>>>
>>>>>> **Workshop participant 1:** Demo My-E: Needs pc to demo software and
>>>>>> wants to show video (can bring own laptop or just disc - need
>>>>>> to let him know).
>>>>>>
>>>>>> **Workshop participant2:** pc / monitor for video presentation.
>>>>>>
>>>>>> **Workshop participant3:** PC and with two VGA connections to 2 projectors
>>>>>> (or monitors)

>>>>>>

>>>>>> Thanks

>>>>>> **[Name of organiser 2]**

>>>>>>

>>>>>> **[Name of facilitator1]** wrote:

>>>>>>> Hi **[Name of organiser 2]**,

>>>>>>>

>>>>>>> I booked in Friday 5th 10-1 and all day Monday 8th in the

>>>>>>> diary.

>>>>>>>

>>>>>>> I would slightly prefer to be able to meet with some people

>>>>>>> on the Friday morning. That would give **[Name of facilitator 3]** and I Friday

>>>>>>> afternoon to get on with working out how to solve any

>>>>>>> technical requirements and allow me to report back on

>>>>>>> progress on Monday and let you know about any problems.

>>>>>>>

>>>>>>> I've seen from **[Name of organiser 1]**'s email to participants that people
might

>>>>>>> want to connect laptops to screens or load content onto the

>>>>>>> system to display through projectors. This should all be

>>>>>>> fine but we'll need to have a think about the best way to do

>>>>>>> this and also to see whether we need to give any specific

>>>>>>> instructions about format etc to participants.

>>>>>>>

>>>>>>> Thanks,

>>>>>>> **[Name of facilitator 1]**

>>>>>>>

>>>>>>>

>>>>>>> **[Name of organiser 2]** wrote:

>>>>>>> Hi,

>>>>>>>

>>>>>>> We'd like to arrange a time to meet for finalising

>>>>>>> arrangements for the workshop. The last time we were down

>>>>>>> **[Name of facilitator 1]** provisionally booked us a slot (I think friday 5th or

>>>>>>> monday 8th before the workshop) but I'm afraid can't

>>>>>>> remember the exact time. If you think that meeting on

>>>>>>> Monday the 8th leaves enough time for all the arrangements

>>>>>>> this would be our preference. Otherwise most of us can make

>>>>>>> friday 5th. We will of course send you an outline of the

>>>>>>> workshop and any requirements we know of before this (e.g.,

>>>>>>> some people are bringing technology to demo and will need

>>>>>>> monitors etc). Is there anything else from your side that

>>>>>>> we should be doing?

>>>>>>>

>>>>>>> Thanks

>>>>>>> **[Name of organiser 2]**

>>>>>>>

>>>>>>>

>>>>>>>

Email communication 2: Similar to the previous, this chain of emails exchanged between the workshop organisers and Qspace's facilitators was forwarded to the researcher by one of the workshop organisers. However, in this communication one more of the interested parties – a participant – is involved (even indirectly) in the negotiations.

From: [Name of organiser 3] [mailto: organiser3@university.ac.uk]
Sent: 08 December 2008 16:46
To: K.Pantidi
Subject: Fwd: demo

Begin forwarded message:

From: [Name of Facilitator 3] <Facilitator3@uni.ac.uk>

Date: 10 September 2008 12:16:32 BST

To: [Name of organiser 3] [mailto: organiser3@university.ac.uk], "[Name of facilitator 1]"

Subject: RE: demo

Hi [Name of organiser 3],

In response to your "insistence" to provide a VGA lead connected directly to a projector for your key note speakers, we have dropped a cable to a position that we hope is acceptable. We are also putting in an audio connection via a 3.5mm jack. [Name of facilitator 1] and I ran through this morning and all seems to be fine.

As a side note. The technology within Qspace is not configured to plug laptops into the control system, which I'm told you were made aware of at the beginning. We are often asked to provide VGA or DVI inputs to our system which we resist not to be difficult but because in doing so it has implications to the balancing of assets (computers and output displays) within the system. This also restricts innovative use of display and audio outputs (one device to one output) no use of the various matrix boxes available. Interestingly, people who at first were quite unsure about using our computers and wanted to plug in theirs have become quite comfortable with passing over to us a usb drive of their content (Mac users as well), we still have problems with content transfer but the advantages of using our control system are seen to outway the content transfer overhead.

There is of course an argument to say we should allow for an integrated (lap top plug in) to the system, and this is something that we are looking into, but the problem of doing so is not trivial.

We are keen to make the two days workshop a success and will do our best to keep people happy.

Cheers

[Name of facilitator 3]

Ps. We had **[Name of Participant 1]** four URL driven demo (old flash version) working this morning

-----Original Message-----

From: **[Name of organiser 3]** [mailto: organiser3@university.ac.uk]

Sent: 09 September 2008 17:00

To: **[Name of facilitator 1]; [Name of facilitator 3]**

Cc:

Subject: Re: demo

Hi **[Name of Facilitator 1]**,

Yes it is the 4 projector demo

The email with the URLs on it's way (sorry, thought I'd forwarded that already)

All 3 of our keynotes are really against the idea of not being able to use their own laptops. As keynotes, it would be expected that they might change their talks throughout the workshop in line with what the other participants talk about. Also, they can do without the added stress of worrying whether or not their presentation will work properly.

I talked with **[Name of Organiser 4]** [about this and she's pretty insistent that we should do all we can to keep them happy (and I agree: they are flying halfway across the world and giving a talk for no money)

I think we're going to have to insist that we can go with the messy hardwired cable option for all three. With this in mind, would it be possible to remove that projector from the matrix for the whole workshop? We can bring long VGA extensions if useful for getting the

wire to a more acceptable location.

Thanks,

[Name of organizer 3]

On 9 Sep 2008, at 16:32, **[Name of Facilitator 1]** wrote:

Hi **[Name of organizer 3]**,

Is it **[Name of Participant 1]**'s '4 projector' demo that needs the legacy version of flash?

It will be a bit of a nightmare to try and downgrade 4 of the PCs to an earlier version of flash.

Is there any way he can give us the URLs now so we can test it on the machines? It may be that we don't have the latest versions of flash installed anyway.

R.e. people plugging in laptops - **[Name of Facilitator 3]** has suggested that we ask both **[Name of Participant 1]** and **[Name of Participant 4]** to convert their presentations and give us the powerpoint versions, but that we keep the messy hardwired cable option as a 'plan B' if they are not happy with the converted

presentations. This seems sensible to me.

[Name of Facilitator 1]

[Name of Facilitator 3] wrote:

FYI

From: **[Name of organizer 3],**

Sent: 09 September 2008 12:35

To: **[Name of Participant 1]**

Cc: **[Name of Facilitator 3]**

Subject: Fwd: demo

Thanks for the info **[Name of Participant 1]**. I'll check with **[Name of Facilitator 3]** in the CETL to see if

we can arrange the demo

(I'll also see if there's a way we can arrange to let you use your own laptop)

Cheers,

[Name of organizer 3],

Begin forwarded message:

*From: *[Name of Participant 1]

*Date: *9 September 2008 05:17:07 BST

*To: *[Name of organizer 3],

*Subject: **demo*

hi [Name of organizer 3],...

we're having a little trouble with our demo...

it runs under Flash plug-in 9,0,47,0

but it doesn't work with the newest Flash plug-in 9,0,124,0

that means your people would likely have to install the legacy version for it to run there.

that's a bit of a pain, and if you'd like to skip it, that's fine.

if you want to move forward with the bigger show, let me know and

i'll send the setup details. it's very easy, really, just typing a

URL, logging in, and a few mouse clicks.

also...


you said in an earlier note that you wanted me to upload my presentation. i am ALWAYS fearful of that because i'm a Mac user and invariably images or video don't come through correctly. is there ANY chance i could use my own laptop to give the talk? PLEEZE :-)?

[Name of Participant 1]

Appendix 3: Qspace and Cspace Information Sheet

This appendix is referred to in Chapters 5 and 6.. It includes the information sheet and consent form that was used for the studies in Qspace and Cspace.

Qspace Consent Form and Information Sheet


The Open University

Consent Form: How technology-rich multipurpose spaces are used: An ethnographic study

The Open University's Human Participants and Materials Ethics Committee requires that all participants in our observational study, give their written consent:

I agree to take part in this research project and I may withdraw from the study at any time. An Information Sheet highlighting the salient points about this research, including ethical and confidentiality considerations, has been made available to me.

Signed _____ Date _____

Email: _____



Information Sheet: How technology-rich multipurpose spaces are used: An ethnographic study

My name is Nadia Pantidi and I am a first year PhD student in Computing at the Open University. We are delighted that the [<name_of_space>](#) will be helping us with our research into technology-rich multipurpose spaces. The research is investigating how technology-rich multipurpose spaces are appropriated in practice at a daily basis and for different types of activities. This information sheet gives you some background on the research and what is involved in taking part in the research project.

Who will carry out the research?

The research team is from the Computing Department at the Open University and consists of a PhD student, Nadia Pantidi, and her supervisors, Yvonne Rogers and Hugh Robinson. Their details appear at the end of this document. Nadia Pantidi will be carrying out most of the observational work.

What is the research about?

Our research is about how people appropriate and use technology-rich multipurpose spaces. 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. *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. Our research aims to improve that understanding by sharing our findings with the community via appropriate journals and conferences.

This study builds on previous results from Nadia's pilot study. For her previous study, she carried out an observational fieldwork study of a technology-rich multipurpose space based in a library. This study will extend the previous work by investigating the context of actual use of another technology-rich multipurpose space, [<name_of_space>](#).

What does the research involve?

Observational fieldwork involves a researcher observing, in a non-intrusive fashion, some aspect of the space's daily activities and capturing details via field notes and, sometimes, photographs. Informal conversations (that occur during lunch or other natural breaks in the work) between the researcher and participants may provide further insights that can feed back into the study.

How will I know what's happening on a day-to-day basis?

Nadia will attend the daily [standup](#), and will keep you informed of what's planned for the day in terms of observational work, etc. and whether or not it involves you.

What if I don't want to be involved?

For whatever reason, that's fine – just let us (Nadia, or any member of the team) know and we will respect your wishes. You can also request that any data that you have provided is destroyed. You can do this for the whole study, if you wish, or as and when you need to on a daily basis.

What about the results of the research? ... and confidentiality?

All our research activities will be conducted so as not to bring the [<name_of_space>](#) into disrepute. After some analysis of the field notes, we will hold a feedback session to discuss our findings.

We expect to eventually publish our research findings in appropriate journals and conferences. Any use of the research data from the observation will be [anonymised](#) so that the identity of individuals remains confidential.

Is this research ethical?

We at the Open University are committed to high standards of professional conduct in all research activities. As researchers, we are required to adhere to guidelines provided by the university's Human Participants and Materials Ethics Committee, who approve research undertaken with human participants. One of the requirements is that participants acknowledge on a separate consent form that they understand the purposes of the research and all that participation entails.

Nadia Pantidi
PhD Student
k.pantidi@open.ac.uk

Prof. Yvonne Rogers
Principal Supervisor
Y.Rogers@open.ac.uk

Prof. Hugh Robinson
Co-supervisor
h.m.robinson@open.ac.uk

Cspace Information Sheet and Consent Form



The Open University

Information Sheet

My name is Nadia Pantidi. I am a second year PhD student in Computing at the Open University doing research on technology-rich learning spaces. Specifically, I am looking into how people use and interact with these spaces; how they negotiate and appropriate the affordances of the physical space and the technology in respect to the activity at hand. This week I will be conducting research at the TechnoCafe. I would be delighted to answer any questions or provide further information about my work to anyone interested; feel free to ask me in person or email me at k.pantidi@open.ac.uk.

Thank you,
Nadia



The Open University

Consent Form: How technology-rich multipurpose spaces are used: An ethnographic study

I agree to take part in this research project and I may withdraw from the study at any time. An Information Sheet highlighting the salient points about this research, including ethical and confidentiality considerations, has been made available to me.

Signed _____ Date _____

Email: _____

Appendix 4: Cspace questionnaires

This appendix is referred to in Chapter 6, section 6.4.2. It includes samples of the filled questionnaires that were given out to the students during the practical sessions

Sample Questionnaires

Techno Café Questionnaire

1. When did you first visit/use the Techno Café (approx. date and occasion)?
Open day - Feb 08
2. How often have you been using the Techno Café after your first visit?
(Please indicate on a weekly/monthly basis depending on frequency)
Very ~~often~~ occasionally, until now
3. For which type of activities do you mainly use the Techno Café?
presentations, but now for group work
4. What do you think of the space?
 - Physical layout (e.g. seating, booths etc)
Spacious, informal
 - Technological infrastructure (e.g. interactive SmartBoard, tablet pcs etc)
Useful
5. Do you use the interactive features of the SmartBoard? If yes, please indicate frequency and occasion.
No
6. Do you use the study areas in the library? If yes, please indicate how often and for what type of activities.
No
7. Anything you would like to add about the Techno Café?
Hot drinks would be nice

I may need some more feedback later © If you are happy to contribute, write your email here:

Thank you for participating!

Techno Café Questionnaire

1. When did you first visit/use the Techno Café (approx. date and occasion)?

20/10/09

2. How often have you been using the Techno Café after your first visit?
(Please indicate on a weekly/monthly basis depending on frequency)

Bi-weekly

3. For which type of activities do you mainly use the Techno Café?

Group project work

4. What do you think of the space?

- Physical layout (e.g. seating, booths etc)

Very nice

- Technological infrastructure (e.g. interactive SmartBoard, tablet pcs etc)

Very nice

5. Do you use the interactive features of the SmartBoard? If yes, please indicate frequency and occasion.

Not yet

6. Do you use the study areas in the library? If yes, please indicate how often and for what type of activities.

Weekly, working between lectures

7. Anything you would like to add about the Techno Café?

Could do with a hot drinks machine

I may need some more feedback later © If you are happy to contribute, write your email here:

Thank you for participating!

Techno Café Questionnaire

1. When did you first visit/use the Techno Café (approx. date and occasion)?
Open day, there were presentations by the department
2. How often have you been using the Techno Café after your first visit?
(Please indicate on a weekly/monthly basis depending on frequency)
infrequently
3. For which type of activities do you mainly use the Techno Café?
group work
4. What do you think of the space?
 - Physical layout (e.g. seating, booths etc)
good
 - Technological infrastructure (e.g. interactive SmartBoard, tablet pcs etc)
useful for groups
5. Do you use the interactive features of the SmartBoard? If yes, please indicate frequency and occasion.
rarely
6. Do you use the study areas in the library? If yes, please indicate how often and for what type of activities.
Every few weeks for study
7. Anything you would like to add about the Techno Café?
A waiter
A menu

I may need some more feedback later © If you are happy to contribute, write your email here:

Thank you for participating!

Techno Café Questionnaire

1. When did you first visit/use the Techno Café (approx. date and occasion)?

First day, never since... other than today.

2. How often have you been using the Techno Café after your first visit?
(Please indicate on a weekly/monthly basis depending on frequency)

Once a year.

3. For which type of activities do you mainly use the Techno Café?

Self meetings

4. What do you think of the space?

- Physical layout (e.g. seating, booths etc)

Comfy, good for group work.

- Technological infrastructure (e.g. interactive SmartBoard, tablet pcs etc)

Hard to use. Main reason I don't come in here.

5. Do you use the interactive features of the SmartBoard? If yes, please indicate frequency and occasion.

No.

6. Do you use the study areas in the library? If yes, please indicate how often and for what type of activities.

No.

7. Anything you would like to add about the Techno Café?

No.

I may need some more feedback later ☺ If you are happy to contribute, write your email here:

Thank you for participating!

Appendix 5: Interview Scripts

This appendix is referred to in Chapter 3, section 3.3.1. It provides the interview scripts used for the three studies. Note that the interviews were semi-structured and as a result the scripts below do not provide the full list of questions asked during the interviews.

Space managers and facilitators

- How did you first come up with the idea of making <name_of_space>?
- What exactly is <name_of_space>?
- Did you hear about other similar spaces that helped or inspired you into designing <name_of_space>?
- Who can use <name_of_space>?
- What can somebody do in <name_of_space>?
- What would be the ideal use scenario of <name_of_space> for you?
- What feedback or comments do you get from OU staff or visitors? Do they like <name_of_space>?
- Do they want anything changed?
- Do you know any similar spaces that were created after <name_of_space> in other universities?
- Any future plans?

Regular Users

- What do you think of <name_of_space>? (General idea ex. interesting, comfortable ,cosy etc)
- In your email you told me that you come here often. How often is that?
- What do you usually do in the <name_of_space>?
 - [After initial response ask more specifically: Chatting / Meetings /Supervisors meetings /Planning papers/ Dry-runs of presentations/ Playing PS3,Wii,XBox etc
- Why do you prefer doing (whatever mentioned before) in the <name_of_space> and not somewhere else?

- When you have meetings or planning papers doesn't it bother you that anybody can enter <name_of_space> and interrupt?
- Have you ever used the: PS? Wii? Xbox? Podcast Zone? Mac Zone?
- [If no, would you like to?]
Ask for all (PS/ Wii Xbox /Podcast zone /Mac Zone)
- [If no, why?]
If no answer, prompt: Not enough time? Not interested? They were occupied?
- What do you think <name_of_space> is for?
- Who do you think uses the <name_of_space> ?
[If more than one mentioned, clarify who uses primarily/more e.g. librarians/Teaching staff/ Phds/ Research staff
- Would like any future changes in <name_of_space>?
- [If yes] Why?
Do you find them necessary?

First-time Users

- Have you been in <name_of_space> before?
- What do you think this space is for?
- Do you think it is private or public/open access?
- What are your first impressions about the space?
- [If not mentioned] What do you think of its architectural layout?
- [If not mentioned] What do you think of its technological infrastructure?
- [If not mentioned before] Who do you think uses this space and for what reasons?

First-time Users (after having used the space for the first time)

- Have you been in <name_of_space> before?
- What do you think this space is for?
- Do you think it is private or public/open access?
- What are your first impressions about the space?
- Let's talk about the event you participated (what the event was about, topic, participants, duration)

- Can you talk me through the day (activities that took place)
- How was the space configured (wall/curtains/seating technology arrangement)?
- Did the physical layout of the space change at any point during the day? If yes, can you remember how this happened (who did it, on what occasion)?
- Did you use any of the technology in the space during the event? If yes, which ones?
- Did you encounter any difficulties when using the space?
[If yes] Can you provide some more detail/examples?
- Was there anything you would like to be different in <name_of_space>?