A YOUNG NOMAD'S GUIDE TO NEW DIGITAL TERRAIN

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DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, any editorial work, paid or unpaid, carried out by a third party is acknowledged.

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GLOSSARY

AI	Artificial Intelligence	Branch of computer science concerned with understanding the mechanisms underlying thought and intelligent behavior and their embodiment in machines.
BLOG	WeBLOG	Web site about a particular topic, functions as an online journal written by one or many contributors.
MoBlog	Mobile Blog	Blog that consists of content posted to the site from a mobile or portable device such as a PDA. Often involves publishing from a mobile device.
CHI	Computer-Human Interaction	Pronounced 'kai'. See HCI
CTP	Critical Technical Practice	Approach to technology that utilizes critical and cultural perspectives in the design process. Underlying assumptions and attitudes to technology design are addressed.
IT	Information Technology	Broad area concerned with all aspects of managing and processing information using computer technology.
JABBER	Commercial Product	Real-time messaging system that utilizes enterprise instant messaging. Offers message archiving features.
JXTA	Short for Juxtapose.	Technology that is a set of open protocols that allows any

	Software.	connected device on a network to communicate and collaborate in a peer to peer manner.
MP3	Media Picture Expert Group-1 Audio Layer 3	Originally developed as a standard of compression of movie and video data. Compressed files can be easily archived or transmitted on the Internet.
MPEG-21	Motion Picture Expert Group -21	Specifically, MPEG-21 defines a "Rights Expression Language" standard as means of sharing digital rights/permissions/restrictions for digital content from content creator to content consumer. As an XML-based standard, MPEG-21 is designed to communicate machine-readable license information and do so in a "ubiquitous, unambiguous and secure" manner.
MMS	Multi-media Messaging Service	Store and forward service that allows the exchange of multi media messages such as graphics, photographic images and video files.
MUDS	Multi-User Dungeons or Dimension	Software program, network accessible that allows connections from multiple users. Often called "players', they communicate in real time using text based commands and share a kind of electronically represented virtual place. This transforms the experience from a solitary one into a social one.
NUD*IST	Commercial Product	Software program designed for qualitative research.
PDA	Personal Digital Assistant or Palmtop	Originally designed as a personal organizer but now more sophisticated allowing access to the Internet via Wi-Fi and Bluetooth technology Data can be synchronized with a home computer.

SIGGRAPH	Special Interest Group on Graphics and Interactive Techniques	Branch of the Association for Computing Machinery. ACM SIGGRAPH. Umbrella organization for IT professionals. Promotes the generation and publishing of information on the interests of the computer graphic and interactive technologies communities. SIGGRAPH has a focus on hosting conferences.
SITCRC	Smart Internet Technology Cooperative Research Centre	Established and supported by the Australian government for the purpose of combined research in artificial intelligence, network development and other fields to develop improved applications and technologies.
SMS	Short Message Service	A store and forward service feature available on most digital phones enabling the user to send and receive short text messages.
2G Phone	Second Generation Phone	Cellular wireless system based on digital technology. 2G systems offer increased voice quality and capacity to handle more calls. Historically, 2G systems provided voice and 9.6-14.4 Kbps circuit-switched data service. Today, 2G systems are being replaced by 2.5G and 3G networks
3G Phone	Third Generation Phone	Next step system designed to increase voice capacity and provide high-speed data. According to the official ITU definition, a 3G network must provide a minimum of 144 Kbps from a moving location, or up to 2 Mbps from a fixed location. Enable users with high-speed data, advanced global roaming and enhanced multimedia capabilities. CDMA provides the basis for 3G technology, which has been implemented as CDMA2000® and WCDMA (UMTS)

UMTS	Universal Mobile Telecommunications System	Part of the global 3G group. New generation of broadband multi-media mobile telecommunications technology. European third generation wireless standard intended to have world wide coverage, including remote areas, and support voice and data simultaneously. Also a generic term used for Wideband-Code Divided Multiple Access. (W-CDMA)
UCD	User Centered Design	Methodology in which users problems, requirements and preferences are involved in the analysis, design and subsequent evaluation of prototypes. Technological considerations alone do not generate the technology.

LIST OF SELECTED PUBLICATIONS

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ABSTRACT

In the early twenty first century, the mobile phone plays an integral role in helping young people shape their identity and achieve social goals. This means that designers of mobile phones are not only creating an artefact that will have a functional purpose for the end user, but one that will be saturated with cultural meanings. In response, the research conducted for this thesis aims to investigate the use of mobile phones in youth cultures so the social and cultural intricacies of interactions can be understood. Consistent with a user centred design approach, the insights from the user study are applied to the development of new technology. The result is the development of The Swarm; a mobile phone prototype that meets the specific social and cultural needs of the young users in the study. Integral to this is the development of a methodological approach that embeds cultural theory within Human Computer Interaction and more specifically, the user centred design process.

PART ONE

UNDERSTANDING THE PHENOMENON AND DEVISING THE USER CENTERED DESIGN STUDY

CHAPTER 1

INTRODUCTION: THE MOBILE PHONE AS THE DEFINING ARTEFACT FOR THE EARLY TWENTY FIRST CENTURY

> As the most concrete and pervasive manifestation of cyberspace, the mobile telephone establishes new cultural patterns of behavior. If, through observation, we can learn the form of these new patterns, we could design a device which plays into and amplifies them (Pesce and Fraser, 2005, p.20).

One of the defining characteristics of our relationship with technology is our expectation that each new development has the capacity to shape the fabric of everyday life. As Winner (1999), in the essay "Do Artefacts have Politics" noted, "The things we call 'technologies' are a way of building order in the world" (p.30). With the Industrial Revolution of the 1880s we believed that trains would shrink time. With the advent of the Information Age in the 1990s we predicted that the Internet would collapse time and space. In the early twenty first century, a current heir to this type of powerful rhetoric is the mobile phone.

The discourses surrounding the mobile phone herald the artefact as the defining cultural icon for the digital generation, the one item a person can possess to represent their status as a participating member in early twenty first century society. "If you want to assure yourself that you belong to the new century, this is the object to have in your hands" (Myerson, 2001, p3). Claims of this nature reveal much about the cultural times in which we are living. It can be seen that the shift from a post-industrial to digital society results in a culture that is not only obsessed with being in constant contact with each other, but where the idea of connectivity actually defines the culture.

Once we have seamlessly incorporated each new technological development into our lives and don't notice it anymore the rhetoric dies down, As Wiser (1991) notes, some technologies become so familiar, and so much a part of everyday life, that they are no longer a focus of conscious attention.

Yet in order to contribute to design, the discourses surrounding the uptake of new technologies are important to explore. So too, are the pathways to adoption, which provide compelling insights into the dynamics that result from the intersection of 'users', 'technology' and 'culture'.

As Myerson (2001) points out, "The mobilization of the phone isn't really a technological process - it's cultural" (p. 7). This suggests the artefact's existence is not so much a result of technological determinism, as it is shaped by contemporary developments in society and culture. Yet the mobile artefact is itself, a powerful force for creating new cultural formations (Katz and Aakhus, 2002). Not only has mobile technology impacted on everyday life, it has altered concepts of technological determinism itself. Changes to society are not demarcated by a radical overhaul of the basic mechanisms of day-to-day life. Instead, the disruption is placed more subtly into the cultural realm and what is changed is our sense of identity as we redefine ourselves and the world we live in through our interaction with our mobile devices;

> Whatever it is called, and wherever it is used, this simple, accessible technology alters the way in which individuals conduct their everyday lives. It has extensive implications for the cultures and societies in which it is used; it changes the nature of communication, and affects identities and relationships. It affects the development of social structures and economic activities, and has considerable bearing on its users' perceptions of themselves and the world (Plant, 2001, p.23).

Ultimately, exploring the pathways to adoption reveals the mobile phone both shapes, and is shaped, by society. Significantly, the many changes brought about by mobile phone use are occurring within a cultural dimension. The implications for design are that studies of use must address the notion that the mobile phone brings with it more than communication, it brings powerful notions of personalization and identity. Real life social networks have gone digital, or more specifically, require a digital component to flourish, which means mobile facilitated interactions must complement face-to-face friendship networks.

User studies need to look at how real life friendships are formed and at the ways in which young people identify themselves through the interactions. This represents a considerable challenge for human computer interaction (HCI) practitioners who must look beyond 'efficiency' and function' to such abstract notions as 'identity' and friendship':

> For years the lighthouse of 'productivity' has guided technologists in the rough seas of design, its beam illuminating 'efficiency', 'efficacy', and 'effectiveness' as the promised lands of success. But recently new goals for HCI are being articulated, and new design principles are being formulated. For example, much attention is now given to design that supports more authentic, rich human experiences taking into account the complex meaning making activities we engage in every day (Boehner, David, Kaye, and Sengers, 2005, p.1).

A new design ideology or philosophical shift within HCI is starting to occur. It is characterized by the need to seek out and understand user needs in light of the complex cultural formations that are produced through interactions. Gaver, Dunne, and Pacenti (1999) and Sengers (1999) achieve these sorts of insights through the use of non-conventional methods that include theoretical perspectives borrowed from art movements and post-modern theory respectively. In doing so, they not only provide philosophically informed perspectives of user needs; they draw attention to the potential benefits of critically informed HCI methodologies.

1 CONTEXT OF THE RESEARCH

The research was conducted in conjunction with the User Centered Design Project of the Smart Internet Technology Cooperative Research Centre (SITCRC). The SITCRC is conducting a seven-year project to develop new digital technologies for the year 2010. The stakeholders are academic institutions, industry partners and government bodies.

A major aim of the SITCRC is to establish "a user-focus in the discovery phase of the development of the design of technological innovation" (Singh, Burke, Turner, and Castro, 2003). In order to achieve this, the principles of user centered design, specifically Carroll (1997) and Cooper (1999) were adhered to. The focus was on understanding the 'culture of use' in order to identify the gaps between what users do, what they want to do, and what the technology allows them to do.

Due to the mix of stakeholders that includes private sector funding, commercial output was a consideration. Therefore, the expectations were that PhD candidates within the SITCRC User Centered Design Project would conduct studies that would look for problems particular user groups encountered that could be addressed by technical solutions.

One of the key user groups the SITCRC identified as having unique needs was 'young people'. In accordance, an emphasis on understanding young peoples' interaction with technology drove the research conducted for this thesis so that their user needs could be established and incorporated into the design process.

1.1 Research Aim

The research was conducted to gain a broad understanding of mobile phone use in youth culture, specifically in Melbourne, Australia. Ideally, the insights would provide the SITCRC User Centered Design team with information that could contribute to the development of new technology.

It is significant to note that, initially, the study was intended to cover a wide range of new digital technologies including the Internet, e-mail, virtual communities such as multi-user dungeons (MUDS) and gaming. Difficulties arose because participants in the early interviews were so engrossed with talking about their mobile phones that other technologies were only given passing consideration. This was particularly noticeable when trying to get participants to talk about technologies in the context of achieving social and cultural goals. Questions about mobile phones generally revealed thoughtful, detailed answers about what social and cultural purpose interaction brought with it. On the other hand, questions about other technologies were more likely to be met with brief responses that focused on the moment of interaction. This led to a narrowing of the research to focus on mobile phone interaction.

The narrowing of the focus from new digital technology to mobile phones represented a significant shift in the parameters of the research. Yet, the convergent nature of the mobile artefact reduced the impact. This is because during the research period the mobile phone was rapidly converging with other technologies and services such as the Internet, digital cameras and games and so the relevance of a broad understanding of digital technologies remained.

1.2 KEY RESEARCH QUESTIONS AND RESEARCH SCOPE

In order to understand young peoples' needs in terms of design four key research questions were posed:

1. What does the current literature tell us about young peoples' use of mobile phones?
2. What is an effective multi-disciplinary methodology for a user centered design study of young peoples' use of mobile phones?
3. What are the user needs of young people that can be addressed with a design solution?
4. How can the user needs identified in the study be translated into design?

So that the key questions could be addressed, the research was divided into three parts. The first part, 'Understanding the Phenomena and Designing the User Study' addressed research questions one and two. The second part, 'the user study' explores question three. The third part, 'Translation' examines the fourth research question.

Part One: Understanding the Phenomenon and Formulating the Study

To understand the phenomenon of mobile phone use within youth culture, a literature review (see chapter 2) was conducted that drew from a wide range of areas including social and cultural analysis, marketing reports, industry sponsored research and HCI. Although the phenomenon was looked at from diverse perspectives, it was clear that understanding the complexities of young peoples' mobile phone use in terms of future design would pose a distinct challenge. Much attention was placed on deciding which research methods and theoretical perspectives should be incorporated into the user centered design approach (see chapter 3).

Part Two: Identifying User Needs

Thirty-five technologically competent users, 18-30 years old, living in Melbourne, Australia participated in the empirical user study (see chapter 4). The method of the open-ended interview (Minichello, Aroni, Timewell, and Alexander (1995) was used to conduct the study and grounded theory (Strauss and Corbin, 1990) was used to analyze the data. The results of the user study are presented in chapter 5.

Part Three: Translating User Needs into Design

In order to assist the process through which the user needs identified in the study were translated into design implications, concepts from cultural theory were used as an analytical lens.

The application of abstract cultural theory concepts to the practical act of translating user needs into design is described in chapter 6.

Once the findings from the study had been translated into user needs and design implications they were shared with the other members of the user centered design team. In keeping with the principles of Cooper (1999) and Carroll (1997), scenario based design was called upon. The user needs and design implications were embodied by a scenario called The Swarm. The development, testing and prototyping of the Swarm will be discussed in chapters 7, 8 and 9.

1.3 LIMITS

A number of limits constricted or problemitized the research and thesis writing process. These included difficulties in avoiding the homogenization of young people, the problem of uneven access, coping with information blowout due to the highly multidisciplinary nature of the research and finally, difficulties in defining the constantly changing mobile artefact.

1.3.1 AVOIDING HOMOGENIZATION AND ACKNOWLEDGING THE DIGITAL DIVIDE

The research presented in the thesis refers to 'young people'. The author would like to make clear that the generic use of the term is not intended to homogenize diverse, localized practices. Rather, it is designed to highlight the uniqueness of young people as a user group for whom technology has broken down the boundaries of cultural and geographical difference (Geser, 2004; Katz and Aakhus, 2002). However, although technology is shaping a new generation of young users, the author would like to draw attention to the 'digital divide' (Castells, 1996) in that there are many young people for whom access to technology is but a remote possibility.

1.3.2 AVOIDING CONCEPTUAL BLOWOUT

Establishing and realizing limits and boundaries was a vital part of constructing the thesis. The intensely multi-disciplinary nature of the research, which spans sociology, cultural theory, human computer interaction and scenario based design, meant that including wide ranging background research for each area could cause information blow out. This was in keeping with the experience of Parsons (2005).

Parsons (2005) was inspired by the integration of highly diverse, multi-disciplinary design teams reported on by Weiser (1991) and he explored a range of alternative disciplines to incorporate within HCI methodologies. He was met with a wall of theories, concepts and philosophies, which led him to stress the importance of selecting a few key texts rather than become engulfed by a proliferation of ideas. With this in mind, the thesis attempts to avoid presenting an overwhelming breadth of concepts and theories for each of the chapters.

The inclusion of literature is limited to texts that are of direct relevance to the key focus of the research. Moreover, in order to reduce repetitiveness due to the high level of overlap between disciplines, a concept that might not appear in one section will often be included in another place. For example, the initial literature review, for the most part, only includes texts that deal specifically with the phenomenon of mobile phones in youth cultures. The research that explores the workings of youth culture, or the nature of communications itself, is not included here, although these concepts are dealt with later in chapter 6.

1.3.3 Defining (and Redefining) the Mobile Phone

The technical capacities of mobile phones are continually evolving (Matsuda, 2005). This means the role of the mobile phone itself must continually be defined and redefined. In the duration of this thesis alone; 2001-2005, the introduction of picture, video, Bluethooth and 3G phones has seen the mobile phone transform from voice and text communicator to multi-media content producer and distributor, Internet portal, e-mail server, on demand television and MP3 player. This convergence of functionalities has made defining and redefining the 'mobile phone' an ongoing challenge of this thesis.

1.4 Prior Influence

The research conducted for the thesis was influenced by the author's background in cultural theory. Initially, the impact was thought to be both subtle and unobtrusive. A text by Haraway (1991) was drawn upon to try and help understand the process through which identity was reconstructed in digital environments. The potentially problematic task of defining 'young people' was made easier by adopting the cultural theory driven notion of 'youth culture' as a demographic that represents an ideology rather than a specific age bracket (Hebdige, 1979). A philosophical framework was provided by Deleuze and Guatarri's (1967) rhizome/arboreal model, which reminds us that for every nomadic user who freely traverses smooth mobile phone space, or seamlessly

creates and distributes content on the fly, there exists another user, struggling with the dystopian aspects of design.

The use of theory in this way added value to the research by providing insights into what happens when users, technology and culture intersect. However, towards the end of the thesis writing process, it became evident that not only were specific theorists being called upon to illustrate particular points, cultural theory was being incorporated into the user centered design process itself. Ideally, the research should be critically examined to see how it shaped the research methodology, and flag each instance where 'theory' and 'design' intersected. It was immediately evident that attempting to pinpoint exactly how abstract philosophical concepts had been drawn into the practical act of analyzing user study data would be problematic.

Even though it had undeniably influenced the user study and the translation of the findings into design, many good reasons existed for not crediting cultural theory as a performer, and at times, even a star performer, in the user centered design process. The most compelling of which was that the analysis was working well at the level it currently stood. It was benefiting from a slight theoretical alignment, but in a subtle and unobtrusive way. As each intersection of cultural theory and user centered design was documented, the previously elegant and seamless transition of data to design seemed encumbered by this additional level of analysis.

Another reason to not explicitly state the methodological contributions of cultural theory was that there were many instances when the use of this additional perspective only enforced current methodologies, or provided insights that would have been uncovered anyway. Nevertheless, in the same way that a magic eye puzzle reveals a distinct image after prolonged gazing at a series of dots, the instances where the outcomes of the research were shaped by cultural theory were swiftly coming into focus. Ultimately, the mapping of this process was to become one of the major contributions to knowledge of this thesis.

CHAPTER 2

LITERATURE REVIEW: TWENTY FIRST CENTURY CIGARETTE? THE NEW CAR? JUST HOW SHOULD WE DEFINE THE MOBILE PHONE?

Ubiquitous, more addictive than cigarettes, empowering, disruptive, the most intimate communications device in the modern world, the new car: just how should we define the mobile phone? The research presented in this chapter specifically examines the literature concerning mobile phones and young peoples' mobile phone use from a diverse range of areas including cultural theory, sociology, market analysis, industry sponsored literature and human computer interaction (HCI).

2 THE EXPLOSION OF LITERATURE ON MOBILE PHONES

When the research into young peoples' use of mobile phones for this thesis first began in 2001, a substantial body of critical analysis of the phenomenon was yet to be incorporated into academic texts. Rather, information about mobile phones was dominated by market analysis investigating market penetration. In 2001, the Center for Media Education's report into young peoples' interaction with new media suggests that "there is a distinct lack of academic research being done in this area and that the only insights available are those provided by market researchers (Montgomery, 2001). However, in the past three years, the mobile phones driven cultures have received more attention from academia and numerous key texts have emerged.

The research in Australia includes the work of Carroll, Howard, Vetere, Peck, and Murphy (2002); Goggin, (2004); Howard, Carroll, Murphy, and Peck (2002); Pesce and Fraser (2005) and also, a selection of the author's work Satchell, 2003; Satchell (2004); Satchell and Singh (2004); Satchell (2005); Satchell, Sing and Zic (2005); Satchell (2006). Internationally, notable contributions have been made by Counts and Fellheimer (2004); Covell, et al. (1998); Hulme and Peters (2001); Geser (2004); Ishii (2004); Ito and Okabe (2003); Katz and Aakhus (2002); Myerson (2001); Plant (2001); Rheingold (2002) and Taylor and Harper (2002). This trend is continuing with a rapidly growing number of conference papers, journal articles, academic books, Internet sites and

chat rooms and M-blogs devoted to understanding the phenomenon of mobile phone use in the early twenty first century. As Ito and Okabe (2003) noted, "The integration of mobile phones into social life is still in its infancy in most parts of the world, triggering a set of socio-cultural convulsions as institutions, people, and places adapt to and regulate its use" (p.1).

2.1 A Snapshot of the Literature Across Disciplines

Mobile phone ownership amongst young people is a relatively new occurrence; however, many accounts of the phenomenon from numerous disciplines have emerged. The snapshot of the literature presented below includes cultural and social analysis, marketing literature, industry sponsored research and HCI.

The inclusion of texts from across these disciplines provides a number of different perspectives. The literature concerned with the cultural and social implications of mobile phones within youth culture provides insights through studies of use which investigate the phenomenon and/or critical theoretical perspectives. The marketing literature reveals patterns of consumption and consumer preferences. The industry-based literature provides a hybrid perspective of academia and industry. Finally, the HCI research is concerned with understanding young peoples' use of mobile phones for design purposes.

The disciplines are presented under separate categories. This sort of segregation is becoming increasingly difficult as more interdisciplinary research into mobile phone use emerges. Therefore, the categories below are not to be seen as stand-alone areas but rather, as disciplines whose boundaries are always shifting - merging and separating with each other to create new hybrid perspectives. As Plant (2001) noted in relation to adopting a methodological framework for analyzing the mobile phone, "The mobile needs a fresh start and an open mind" (p.3).

2.2 Cultural and Social Critiques

Texts that provide cultural and social analysis are useful because they investigate the role of technology in society and the meanings that our interactions with them produce. Major themes to emerge are that the mobile phone is the defining artefact for the early twenty first century. Its uptake is a global phenomenon and although local practices of use emerge, it is the similarities of

use that are most noteworthy. Finally, it can be seen that the mobile phone has created new spaces for social interactions.

2.2.1 The Mobile Phone as the Defining Icon of the Early Twenty First Century

A social and cultural critique of the role of mobile phones in youth culture reveals the mobile phone as the defining cultural icon for the digital generation: the one item that a young person can possess to represent their status as a participating member in early twenty first century society. As noted in the Introduction this is supported by Myerson (2001), "If you want to assure yourself that you belong to the new century, this is the object to have in your hands" (p.3).

As mentioned in the introduction in chapter 1, the younger generation is growing up at a time that is seeing a paradigm shift from post industrial to a digital society. This results in a culture that is not only obsessed with being in constant contact with each other, but where the idea of connectivity actually defines the culture. Mobile phones are becoming a force that shape cultural flows. Furthermore, the mobile artefact has transcended its initial functionality as a communications device and has become a defining symbol of the user's sense of style and taste. This was highlighted by an editorial piece in the Economist magazine that featured the headline "Mobile Phones are the New Car" referring to the way in which users romanticised the sleek lines of their new model mobile phones as they would a sports car (April, 2004). Mobile phones have also been called the twenty first century cigarette by Stewart (2003), who notes that with cigarette advertising being banned, mobile phone advertising has taken over as the item that most represents a 'lifestyle' as opposed to an actual functional product.

2.2.2 Mobile Phones as Globalsing Artefacts

With such iconic importance being attached to mobile phones it is not surprising that the artefacts themselves are becoming globalizing forces. As noted in "Mobile Phones as the Globalsing Artefact of the Early Twenty First Century" (Satchell and Singh, 2004) mobile phones are becoming a major force that shapes cultural flows. This was supported by Geser (2004) who argues, "As they are used literally by everybody, cell phones create a new aspect in which all human beings are equal, i.e. irrespective of age, gender, cultural background, wealth, income or hierarchical position" (p.6).

The globalizing nature of new media in general emerged as a major finding from a study into youth culture and new digital technologies. The study was spearheaded by Livingstone (2002) from the London School of Economics and Political Science and a group of academic research teams made up of investigators from the UK, Belgium, Denmark, Finland, France, Germany, Israel, Italy, the Netherlands, Spain, Sweden and Switzerland. The research consisted of a series of comprehensive national surveys from 1997-1998, interviewing a total of 15,000 children and young people across Europe about their use of media. The findings were published in the book *Young People and New Media: Children and their Changing Media Environment*s (2000). A major finding from the study was that a shared, media-based youth culture was increasingly disassociated from national or class-based structures. Young people use these global media contents in ways that transcend the medium that transmits them. Young fans pursue inter-textual themes (sports, music, stars, romance, and cartoons) across television, computer games, comics and the Internet.

While new digital media provide global discourses that young people share. It can be seen from the research conducted by Goggin (2004) that the mobile phone provides one of the greatest examples of the globalization of youth culture through new media. In "mobile text", Goggin (2004) notes the mass uptake of text messaging and the development of a text shorthand (for example, c u l8r instead of see you later), allows young people to develop a new, global subculture of language that was until recently, inaccessible, unreadable and unfathomable by older generations of users:

> SMS was avidly taken up by young people, forming a new culture of media use. Sending a text message offered a relatively cheap and affordable alternative to the still expensive timed calls of voice mobile. In its early beginnings, mobile text can be seen as a subcultural activity. The text culture featured compressed, cryptic messages, with users devising their own abbreviations and grammar. One of the reasons young people took to texting was a tactic of consolidating and shaping their own shared culture, in distinction from the general culture dominated by their parents and other adults. Mobile texting became involved in a wider reworking of youth culture, involving other new media forms and technologies, and cultural developments (Goggin, 2004, p.3).

2.2.3 Resisting Homogenised Practice

The globalization of youth cultures by the mobile phone does not however, necessarily translate to homogenised practices and many different nuances of use across cultures are now well documented. For example, there is a greater use of the mobile phone by young users to access the

Internet in Japan (Ishii, 2004) with more e-mails sent via the mobile phone than the PC, though to fewer addresses. Plant (2001) proposes there are some broad distinctions that can be made at a global level. She argues that in the Asia Pacific region, where open communication is already in place culturally, the mobile phone is more readily embraced. In China, where there is already much noise, users talking loudly into their phones are tolerated, whereas in other places in the world it is not accepted. In the United States, Plant finds that mobile phone use is, at times, perceived like smoking, something not to be tolerated in a public place. Tjonng et al, (2003) in their study of mobile phone use in Australia and Singapore, argue that Singaporean youth are more likely to personalise their phone and be heavier users than Australian young people.

In the book *Perpetual Contact: Mobile Communication, Private Talk, Public Performance,* the editors, Katz and Aakhus (2002), include essays about mobile phone use from ten cultures from around the world. Each study reveals something unique about mobile use in the particular place. Highlights include Italy, "Italy: Stereotypes, True and False," by Leopoldina Fortunati. In this chapter the author contrasts mobile phone use in Italy with other European countries. It is proposed that the huge success of the mobile phone in Italy is intrinsically involved with the way Italian people perceive the mobile phone as an extension of the human body. Shin Dong Kim's "Korea: Personal Meanings", proposes the informal nature of mobile phone use in Korea is in direct contrast with the nature of the hierarchical society and argues that the framework provided by mobile phone use may well provide a direction for further communication models. The slow uptake of mobile phones in the USA is discussed by Kathleen A. Robbins and Martha A. Turner and highlights that the USA lags behind many European and Asian countries in terms of mobile telephony penetration and usage. The authors blame demographics and regulation issues for this. Christian Licoppe and Jean-Philippe Heurtin's exploration of mobile phone use in France, "France: Preserving the Image" finds that mobile phones are important mechanisms for engendering trust and friendships. Finally, Enid Mante, in "The Netherlands and the USA Compared," looks at the way mobile phone use has not only eroded geographical boundaries between countries, but also broken down divisions between work and leisure.

Although each of these essays provides insights into the unique practices of use that emerge from countries around the globe, the most compelling part of the book is the concluding chapter written by Katz and Aakhus (2002) themselves. In 'Making Meaning of Mobiles - A Theory of Apparatgeist', the authors explain the phenomenon of mobile use through their theory of 'apparatgeist' which can be literally translated to mean 'machine spirit'. Apparatgeist suggests "the

spirit of the machine that influences both the designs of the technology as well as the initial and subsequent significance accorded by users, non-users, and anti-users" (p. 305). For Katz and Aakhaus, the theory of the apparatgeist is embodied by the mobile phone – a device which is stronger than cultural or geographical difference and able to establish new, similar patterns of 'use', 'design' and 'anti-use' around the globe.

The research presented in this section indicates that while there are differences in mobile phone use across cultures, these differences are largely on the surface and it is the similarities which are notable. When current studies are examined and cross-referenced it is clear that mobile phones play a big part in helping young people establish their sense of identity and achieve their social goals. This is a global, rather than a local phenomenon.

2.2.4 Conceptualizing 'Mobile Phone Space' and its Occupants

In a similar vein to the theory of apparetgeist presented above, Langdon Winner (1999), in his essay 'Do Artefacts have Politics', which appears in the book *The Social Shaping of Technology*, argues that technologies can and do have politics. In their introduction to the essay, the editors of the book MacKenzie and Wajcman, find that Winner's approach provides an important framework for thinking about technology and the meanings of our interactions. They note that for Winner, "Some technologies are, in given social circumstances, more *compatible* with some social relations than with others" (p.5).

Winner's essay highlights the importance of theories that try to understand what features and qualities of the mobile artefact make it so desirable. Ito and Okabe (2003) present one of the most insightful theories that explores how the intrinsic qualities of the mobile phone make it so compatible for human interaction.

Ito and Okabe (2003) provide an account of the integration of mobile phones within youth cultures in Japan. In their seminal paper, "Technosocial Situations: Emergent Structurings of Mobile E-mail Use" (2003), they look at how the mobile phone (called 'keitai' in Japan) creates new digital spaces where interaction occurs. They draw broadly from approaches in social and cultural studies of technology to understand the nature of the new spaces that mobile users are interacting in. They call the activity that happens in these new spaces 'technosocial situations':

> What are as of yet under-theorized are the new kinds of social settings enabled through mobile communication that differ fundamentally from prior settings such as workplace, restaurant, face-to-face interaction, or landline telephony. We believe it is necessary to examine the integration of technology, social practice and place in an integrated "technosocial" framework (pp.4-5).

Through their analysis into mobile facilitated interaction, Ito and Okabe chart three 'technosocial' situations that have emerged: 'mobile text chat', the 'ambient virtual co-presence', and the 'augmented flesh meet':

The 'mobile text meet' happens in any location and is unique in that "it is particularly amenable to filling even small 'communication voids', gaps in the day where one is not making interpersonal contact with others, particularly in settings such as public transportation where there are prohibitions on voice calls" (p.12). One of the most prominent places where the 'text meet' occurs they note, is in transit.

Ito and Okabe (2003) use the 'ambient virtual co-presence' to explain how users maintain a continual presence in each other's lives via text messages:

> These messages are predicated on the sense of ambient accessibility, a shared virtual space that is generally available between a few friends or with a loved one. They do not require a deliberate "opening" of a channel of communication, but are based on the expectation that someone is in (virtual) earshot (p. 14).

The 'augmented flesh meet' describes the way in which for young people, members of a social network who are not present physically can be there virtually. This is an important point which draws attention to the idea that mobile phones do not have to alienate other members of a social group who are there physically. Rather, they can in fact, add another dimension to the physical group by bringing in a new member virtually.

Finally, Ito and Okabe note a mobile phone's driven urgency for connectivity in youth culture:

> While mobile phones have become a vehicle for youths to challenge the power-geometries of places such as the home, the classroom, and the street, they have also created new disciplines and power-geometries, the need to be continuously available to

> friends and lovers, and the need to always carry a functioning mobile device. These disciplines are accompanied by new sets of social expectations and manners (p. 15).

From the research conducted by Ito and Okabe (2003), it can be seen that mobile phones are being used to construct new digital spaces where interaction can occur. These spaces are particularly appealing to young people and they are being used to enforce friendship networks by allowing users to maintain a virtual presence in each other's lives. As social networking in these mobile facilitated digital spaces grows, new paradigms of interaction evolve.

2.2.5 The 'Open' Nature of Mobile Artefacts

The previous section examined how the unique qualities of mobile phone generated space contributed to the artefact's desirability. Another feature that enhanced its appeal was the flexibility to allow users to project their own needs onto the device. As Winner (1999) noted, technologies have politics when they have a degree of flexibility that allows for power to be established in a particular setting:

> Technologies of this kind have a range of flexibility in the dimensions of their material form. It is precisely because they are flexible that their consequences for society must be understood with references to the social actors able to influence which design and arrangements are chosen (p.38).

Winner's essay encourages us to explore the politics embedded in an artefact. It can be seen that the mobile phone lends itself to appropriation by users for a seemingly endless array of activities and purposes (DoCoMo, 2001). It would seem that this 'openness' is an integral part of the mobile phone's appeal. As will be discussed in chapter 6, the implications extend to user centered design philosophy, directing the development of new designs that provide users with more opportunity for active interactions and re-contextualisation of technology.

2.3 Market Analysis

Market analysis seeks to understand cultural behavior in order to increase consumption. Although mobile phone use is examined from a different perspective to the cultural and social critiques described above, both disciplines arrive at similar conclusions. The research finds that the mobile phone has transcended its functionality as a communications device to become a defining

icon of youth culture. Furthermore, the findings of these two disciplines identify the mobile phone as integral to young peoples' formation of friendship networks; the sharing of their experiences and finally, the identification of their roles within their social worlds. Marketing literature is also helpful to understand the new and innovative ways in which mobile technologies are being augmented with new functionalities.

2.3.1 Youth Culture is Driven by Technology and Transcends Traditional Boundaries such as Gender

Pankraz (2002), in the article 'The Power of Teens Online', draws on the results of the study conducted by Euro RSCG Worldwide, "Connected and Connectivity – The Power of Teens Online", which examines the way in which teenagers are embracing new digital technologies from a cultural perspective, both in Europe and Australia. He notes "a 'global youth culture' is being driven by technology, rather than by fashion, music, and sport as in previous generations" (p.1).

Pankraz (2002) also paints a picture of mobile phone use amongst young people that is consistent with post feminist theory (Butler, 1990; 1993) in that mobile use amongst young people is not tied to their gender. Rather he finds an equality of use. The idea that mobile phones allow users to transcended culturally constructed categories such as gender, was also supported by Plant (2001) and Geser (2004).

2.3.2 Cementing Relationships

DoCoMo, one of Japan's largest mobile phone companies, commissioned a series of studies that examine the impact of mobile phones on young users. DoCoMo Report No.9, "The Use of Mobile Phones in Everyday Urban Life: A Survey of 1000 People" (2001), was dedicated to "understanding the influence of mobile phones on the everyday life of young people and the relationship between human behavior and the use of cell phones" (p.1).

The research found participants rely heavily on their mobile phones and see them as a way to improve their social and family relations. The users in the study saw their mobile phones as tools for improving personal relationships and revealed they provide a means for cementing friendships, "preventing the drifting apart from others...and allowing users to quickly express their feelings" (p. 9).

2.3.3 Fear of Not Being Connected

The DoCoMo Report No.10, "Current Trends in Mobile Phone Usage Among Adolescents" (2001), analysed the way young people perceive their mobile phone and uncovered the mobile functions they prefer. This study found that the main criticism young people have in regards to their mobile phone is that it is not yet able to offer truly ubiquitous mobility. The most desired improvement was that their mobile phone could allow them to call from anywhere and have batteries that didn't need to be continuously recharged so they would not be stranded. Although the report does not draw specific attention to it, it appears significant that one of the biggest fears the young people in the study had in relation to mobile phone use – was the fear of dis-connectivity itself.

2.3.4 Augmenting Current Technology

The DoCoMo Report No.9, "The Use of Mobile Phones in Everyday Urban Life" (2001), highlights the distinctive way young people use their mobile phones in that the mobile does not just represent communication. The participants in the study augmented the functionality of the communication aspects of their mobile phone by using it to do a wide range of things. The report states, "very few of the respondents use the phone purely to make and receive calls, preferring to utilize the range of features their mobile phone makes available to them" (p. 3).

The DoCoMo (2001) study contrasted young peoples' usage with that of older generations and found that, "Those aged over 50 used their mobiles purely to make and receive calls (p.3)." By comparing young peoples' use with that of older generations a clearer picture emerged of the tendency of young people to augment mobile phone communication with other functionalities, making them a unique user group.

This was supported by The DoCoMo Report No 10 (2001), which found young people want their mobile phone to perform functions not normally associated with it such as translation and interpretation. They also desire a mobile phone that can answer questions, do homework, and give advice. Significantly, they want a mobile phone that can be integrated with their other personal belongings and used instead of tickets boarding trains, or store money so a wallet is no longer needed. This will be examined further in the section on Human Computer Interaction which examines the theory that Anderson (2001) proposes, which is that the most successful new technologies will be those which can augment the function of current technologies.

Finally, Bersten (2002) supports the findings of the DoCoMo reports and argues that mobile phone designers will have to take into consideration the high degree of mobile phone use for purposes other than making and receiving calls. Bersten outlines how the rapid transformation of the mobile phone into a portable, multi-functioning device, allows the user to video conference through high bandwidth, take photos (Siemens), open out to a games console and play network games (Mitsubishi). They can be worn as a pendent that provides navigation for users engaging with UMTS location services (Mitsubishi). They can also allow the user to find restaurants via the location system of UMTS (Siemens) and provide a large, full color screen like a PDA (Nokia).

2.4 Industry Sponsored Literature

The multi-disciplinary nature of the literature concerning mobile phone use sees fruitful collaborations between industry and academia and some of the most comprehensive analysis of mobile phone use comes from these perspectives.

Plant (2001) provides a state of the art snapshot of the cultural role of mobile phones for Motorola in the paper "On the Mobile". The research not only provides a comprehensive international account of use, it provides some important observations about effective methodological strategies for studying mobile phone use. Hulme and Peters (2001) in their study for Teleconomy UK, examine mobile phone use from the perspective of 'early adopters'. Furthermore, they too provide insights into methodological approaches by drawing on cultural theory to position emerging patterns of mobile use within a cultural context. Finally, Jeff Lewis (2003) draws on cultural theory in the critique of mobile phone use in remote regions of Australia in Vodaphone's *Receiver Magazine*.

2.4.1 On the Mobile: An International Perspective

In "On the Mobile: The Effects of Mobile Telephones on Social and Individual Life" (2001), Plant, who is a lecturer in Cultural Studies at the University of Birmingham, investigates how the world's citizens are exploiting the mobile phone revolution. The paper, commissioned by Motorola, provides a comprehensive account of the role mobile phones play in everyday life. The report finds that the mobile phone has changed the nature of communication and affected the identities and relationships of people around the globe.

It is important to note that while this paper claims to provide a global perspective, it does not cover those who do not have access. The concept of the 'digital divide' (Castells, 1996) is not investigated. Nevertheless, Plant (2001) did conduct interviews in eight cities around the world including Tokyo, Beijing, Hong Kong, Bangkok, Peshawar, Dubai, London, Birmingham and Chicago. The paper states, "The international scope of this research has made it possible to identify significant ways in which local, economic, technological, political and cultural conditions shape the use and perception of the mobile" (p.24). Indeed, this global perspective does provide a useful means of contrasting different patterns of use across cultures.

Plant (2001), like Ito and Okabe (2003) talks of mobile phone generated space and notices the unique nature of the interactions they enable. She labels users as 'innies', 'outies' or a combination of both. This relates to the way users deal with an incoming call in a social setting in that a person either leaves the group to take the call, or stays where they are, or both. Plant (2001) states, "even a silent mobile can make its presence felt as though it were an addition to a social group, and many people feel that just the knowledge that a call might intervene tends to divert attention from those present at the time" (p.30). This is an important point; however, it should be contrasted against the finding of Ito and Okabe (2003). Ito and Okabe find that often the caller is a person that is known to the group and that the incoming call becomes a new focus for the conversation of all present. What they call the 'augmented flesh meet'.

Like Pankraz (2002) and Geser (2004), Plant (2001) found there are "few significant gender differences observed" (p.40). However, she did find the mobile phone was empowering and summed this up by her phrase: "I'm not alone. I'm with my phone" (p.45).

Plant (2001) then goes on to look at the social and cultural implications of mobile phone use and ends up with similar findings to Myerson (2001) in regards to the concept of the mobile phone as one of the defining ways in which young people can express their sense of style and taste:

> Teenagers are particularly aware of the fashion aspects of their mobile phones, competing to acquire the latest, coolest models and to customize them in the latest, coolest ways. Everything from the color of the handset to the sound of the ring tone, and the logos and graphics it displays can give it a personal touch (p. 46).

One of the highlights of the paper is her coining of terms to describe the phenomenon she is observing. She uses the term 'stage-phoning' to describe the way users broadcast something about themselves to the surrounding people when they are on the phone.

Plant (2001) also touches briefly on the preciousness of digitally produced content, noting that teenagers often save their text messages; however, as the study was done in 2001 before picture phones, the idea of sharing and distributing content was not explored further.

From a methodological perspective, the research presented in this paper is useful because it makes a number of observations about the process of conducting research into mobile phone use. Plant (2001) notes that qualitative methods, specifically interview techniques are particularly effective for eliciting user responses. She reports that the majority of participants in her studies expressed insightful views of the integral role of their mobile phone in the way they lived their lives.

2.4.2 The Phenomenon of Early Adoption within Youth Culture

The study conducted by Hulme and Peters (2001) for Teleconomy UK, is presented in the paper "Me, My Phone and I". It begins by drawing attention to Nokia's claim "that a mobile phone is the most intimate communications device in the modern world" (p.2). The research includes a qualitative study of over 210 early adopter mobile users and provides one of the most theoretically grounded studies of mobile phone use to date.

Like much of the research reported on in this chapter, Plant (2001), Pankraz (2002) and Myerson (2001), the research conducted by Hulme and Peters (2001) finds that mobile phones provide young people with a sense of identity. "Teenagers use mobile phones in an almost semi-disposable way like a piece of clothing or fashion accessory" (p.2). In order to provide a more in-depth understanding of this process they draw on cultural theory, specifically the work of Jean Baudrillard (1983).

Baudrillard (1993) critically examines the way Western society operates within a framework of capitalism. He laments the reduction of society devoted to the endless pursuit of consumption and finds that we are seduced into the act of buying for the sake of consumption itself. Once the

purchase is made, the product has little meaning, and the search for new products to satisfy the craving continues.

Inspired by Baudrillard, Hulme and Peters (2001) concentrate on understanding the process through which meanings are embedded within consumer goods in order to relate to the way mobile phone users define themselves through their purchase of iconic items such as mobile phones:

> Jean Baudrillard (1983) notes goods have meanings that are generated within the system of signs and symbols, which engage the attention of the consumer. Consumption is never a process of a purchaser trying to satisfy a basic pre-given human need in response to biology. Mobile phones meet no biological need. Baudrillard sees the consumer as always actively creating a sense of identity, both individually and collectively. In this sense the mobile can create or reinforce identity, the status of the device is much more meaningful than the actual device itself (p.2).

Hulme and Peters's Buadrillarian reading of mobile phone consumption sheds light on the process through which mobile phones have transcended their functionality as a communication device and become a means through which users define and communicate their sense of identity.

2.5 HUMAN COMPUTER INTERACTION

HCI is concerned with the development of new technology and while the technology itself is a strong focus, recently, research conducted for this discipline has had a strong social and cultural element. This is a relatively new shift as studies of use previously tended to focus on the design itself rather than the user. This was especially problematic when looking at the impact mobile phones have had on young peoples' lifestyles (Carroll et al., 2002). Recently though, research has emerged within the HCI discipline which puts the users at the centre of the research with enlightening results.

The work conducted by Taylor and Harper (2002) is a prime example of research within the HCI field that examines young peoples' use of mobile phones in terms of the culture that underpins use. They note that the exchange of text messages is one of the most important mechanisms for young people to express their friendship with each other. The exchanges becoming a form of ritualized gift giving.

Research conducted by Carroll et al. (2002) presented in the paper "Just What do the Youth of Today Want: Technology Appropriation by Young People" investigate technology from a social and cultural perspective. In doing so, the authors make a number of important observations. Like the results from the previous research covered in this chapter, Carroll et al., found that mobile phones are integral to young peoples' sense of identity. The study also noted that young people have fragmented lifestyles and that new technologies, including mobile phones, provide cohesion. They noted that information communication technologies (ICT) such as e-mail, mobile phones and chat rooms help young people to develop and maintain virtual communities of family, friends and other young people with similar interests Finally, the authors note that mobile phones provide young people with power to control not only their own technology, but also, their own lives.

> Mobile phones provide a way of dealing with parental or educational authority. Features such as profiles (personalised ring tones for different callers), caller ID and voice mail are used to filter calls so that young people can choose which phone calls that they will answer (p. 4).

2.5.1 ADOPTING NEW TECHNOLOGY

The HCI discipline provides valuable insights into how and why people adopt new technologies. This type of analysis is useful for the section of the thesis that is concerned with translating user studies into design. However, the findings from Andersen's paper, "Personal Technology Architecture" (2001) warrant inclusion in the literature review because it provides insights into the culture of mobile phone use - now and in the future. The paper, which was published in the journal *Ubiquity,* draws attention to the way users of mobile phones add new technologies to pre-existing ones. In keeping with the DoCoMo (2001) findings, he argues that it is much easier to get users to augment their current technology than it is to get them to familiarize themselves with and embrace new concepts. So when thinking about what young people want in communications devices of the future it must be considered that they would rather expand the role of their existing technology than learn something new.

Anderson (2001) found that one of the main reasons Nokia phones have been so successful is because they have expanded their original use of being a hand held device for making and receiving calls by allowing the user to perform a whole variety of new tasks – e-mailing, text messaging, gaming and organising from the familiar environment of their mobile phone. This is

supported by the DoCoMo Report No.9 (2001), which looked at the popularity of the mobile phone for performing tasks not usually associated with mobile devices.

Andersen (2001) predicts that the new mobile PDA hybrids will take over pre-existing functions of personal architecture such as wallet and keys. The device will be natural, rather than alien to the user. Technological innovations such as handwriting and voice recognition, predictive texting, an alternative mini keyboard a high definition, color, digital screen, that can be rolled up and contained within the unit will make interaction with the technology as simple as possible. This concurs with the DoCoMo Report No.10 (2001) in which survey respondents expressed a desire for the mobile phone to incorporate things like wallets and train tickets.

2.6 Conclusion: The Power of the Mobile Artefact

The literature review spanned social and cultural analysis, marketing reports, industry sponsored studies and HCI. There were many converging themes across the disciplines, yet the breakdown was useful, as each category revealed its own, unique insights. The social and cultural literature uncovered the nuances of use that characterized local behavior, yet positioned the findings in light of the globalizing nature of the mobile phone. Ultimately, this revealed the power of the mobile artefact itself. The marketing literature helped to understand the new and innovative ways in which mobile technologies are being augmented with new functionalities. The industry sponsored research provided some of the most comprehensive accounts of use; furthermore, these extensive studies revealed important observations about effective methodological strategies for studying mobile phones. Finally, the HCI research approached young peoples' use of new technology in order to enhance future design. In doing so, it drew attention to the potential of the mobile phone to embody the collection of technological and non-technological artefacts that we currently interact with and carry around on a daily basis. (In the next chapter, the HCI perspective will be called upon to help shape the user centred design study.)

Although the breakdown of disciplines was helpful and the exploration of the phenomena of 'mobile phones' and 'mobile phone use' from such diverse perspectives provided unique insights, it is the common themes across disciplines that were revealing. The overriding theme from the literature review was that while on a practical level, mobile phones facilitate interconnectivity; more significantly, they represent the user's identity as a participating member of early twenty first century society. This represents a unique challenge for the design of future mobile technology. The

next chapter will investigate the best methodological approach for conducting a user study that could understand these subtle nuances of use in terms of design.

CHAPTER 3

METHODOLOGY: SELECTING AN APPROPRIATE MULTI-DISCIPLINARY MIX

A driving force behind the research being conducted for this thesis was uncovering the needs of the young user group so they could be communicated to the computer scientists in the User Centered Design Project in particular and the SITCRC in general. The search for specific areas where technology could make the users' life better drove the research. A major challenge was developing a methodology for achieving this. As Downton (2003) noted, "Methodology is not just a glamorous term for method. Methodology is meta-method. It is the study of methods and, as such, may involve methods for studying methods" (p.12). This chapter describes the process through which the final methodological structure of the research was devised. The result is open-ended interviews for conducting the user study, cultural theory lenses for translating the findings into user needs and design implications and scenario based design for communicating user needs and design implications to the User Centred Design Team and developing the prototype.

3 USER CENTERED DESIGN – SELECTING THE APPROPRIATE MULTI-DISCIPLINARY APPROACH

New technologies play a big part in helping young people achieve their social and cultural goals and ideally, future design will respond to this. However, capturing the intricacies of social interaction poses a challenge for the designers of future mobile devices and novel approaches need to be used. As Carroll et al. (2002) note,

> Developing an understanding of young peoples' use of new technologies is challenging partly because the research context is a diffuse space for work, education, social and leisure activities and partly because the vast organizationally driven IS literature does not seem to capture salient features (p. 1).

Carroll et al., propose that designers of future mobile artefacts for young people need an approach that is different to traditional methods:

> Use of ICT's (information communication technologies) in social interaction and leisure indicates that information systems (IS) researchers need to move beyond the organization to study the design, adoption, use and impact of technology in the contexts in which people live, socialize and undertake leisure activities. (Carroll et al., 2002, p.1)

It can be seen that when designing mobile technologies for young people there is a need for methodological approaches that allow the researcher to capture the intricacies of use within the context of day-to-day situations. Failure to do this can result in what Ackerman (2002) calls the "socio-technical gap", eventuating in designs that are unable to support the social world in all its nuances and contexts. As will be discussed in this chapter, one of the most effective ways of achieving this is through the use of multi-disciplinary user centered design processes.

The user centred design approach is characterized by two features. First, and most significantly, is the importance of putting the user at the centre of the design process. Wixon (1995) notes, "A user centered design process is one that sets users or data generated by users as the criteria by which a design is evaluated or as the generative source of design ideas" (p. 161). The second feature of user centered design is that it spans a range of disciplines. "User centered design (UCD) refers to a multi-disciplinary design approach based on the active involvement of users for a clear understanding of user and task requirements and the iteration of design and evaluation" (Vrendenburg, et al., 2002, p.1).

The multi-disciplinary nature of user centered design makes it particularly amenable to the inclusion of new and innovative approaches for conducting and analyzing user studies. Moreover, the junction of disciplines, can, in the right combinations, enhance the design process. As Hemmings et al. (2002) argue, "…methods and procedures, strategically combined, produced beneficial outcomes for collaborative design work…" (p. 2). They note however, that the multi-faceted approaches usually employed for user centered design, which traditionally consists of psychology, cognitive science, sociology and engineering are inherently geared towards uncovering the needs of users in organizational environments. This is a significant issue because as the focus for design extends its gaze towards a greater diversity of users in a multitude of new settings, there is a need to incorporate new disciplines that may be more effective for understanding the nuances of use in a greater complexity of situations (Ling, 2002).

Of special interest for Hemmings et al. (2002) is the way non-traditional influences can be employed to re-inject traditional studies with new ways of revealing users "emotional, aesthetic, and social values and habits" (p. 6). They note the success of Gaver et al. (1999) in borrowing from the Surrealist and Dada art movements to develop 'cultural probe' kits that include cameras, play dough and an assortment of media through which participants can convey their experiences. These researchers highlight how the components of the user centered design study must be relevant to the nature of the subject matter.

3.1 OPEN-ENDED INTERVIEWS

When considering methodological approaches for the user study, the challenges of understanding the complexities of young peoples' interactions in social environments seemed well suited to the innovative approach of Gaver et al. (1999) in launching cultural probes. However, cultural probes give a different sort of data. They are what Gaver calls 'inspirational' but they don't necessarily paint a clear picture of user needs. Furthermore, it could be seen from the literature review that young people had a strong affinity with their mobile phones. As Plant (2001) discovered, this meant they were likely to have well formed opinions about the effect of mobile use on their day-to-day lives. This sort of feedback is valuable and she noted that the qualitative method of the open-ended interview was particularly well suited to studies of mobile phone use.

It was decided that the qualitative open-ended interview (Minichello et al., 1995) would be adopted for the user study. Thirty-five technically capable users, aged between 18-30, living in Melbourne, Australia were recruited. It was hoped that the intimacy of the interviews would present participants with the opportunity to reflect upon their experiences in the context of their everyday experiences. The focus would be on the analysis of the participants' everyday lives to investigate the gaps between what the users do, what they want to do and what the existing technology allows them to do. The design implications could then emerge as an extension of this process.

It is important to note that the pre-conceived search for practical outcomes set the research apart from traditional sociological research that avoids placing the researcher in a position where they can impose solutions to the participants' problems. This was discussed by Sommerville, Rodden, and Sawyer (1992):

> Sociologists are not usually concerned with discovering improved ways of carrying out a task, with devising techniques and methods for supporting a particular set of behaviors or with inventing new ways of tackling a particular problem. They work very hard to avoid being classed as social engineers who pose 'solutions' to observed social problems. (p351)

3.1.1 LIMITS

In terms of design, traditional qualitative methods, such as ethnography or open-ended interviews are useful for understanding user requirements; however, they are not without their drawbacks. Design practitioners such as Gaver et al. (1999), Hemmings et al. (2002) and Dourish (2004) note shortcomings. For Gaver et al. and Hemmings et al., the qualitative methods that work well for organizational environments may not be the most appropriate method for capturing the intricacies of use in other, potentially more sensitive settings. Meanwhile, Dourish (2004) argues that while qualitative methods such as ethnography provide 'rich descriptions' and 'detailed accounts' of encounters between people and technology, too much emphasis is on the role of the individual in driving outcomes. This results in a failure to account for the complex cultural and social constructions within which we are operating. He argues that traditional approaches to design be enhanced and calls for the 'sociological' component to be extended to include phenomenology and critical studies.

Dourish's call to introduce critical perspectives into the multi-disciplinary mix, coupled with Gaver's success in re-invigorating user studies by borrowing from art criticism, contributed to the decision to introduce cultural theory into the design methodology.

3.2 CULTURAL THEORY

Although not traditionally included as part of user centered design methodologies, cultural theory provides a rich social and cultural commentary. It draws on a diverse range of concepts, ideas and theories to understand phenomena in light of complex cultural formations. In doing so, new ways of thinking about culture and what our interaction with it means are uncovered. In order to demonstrate how it was incorporated into the design methodology for the thesis, the first part of the next section will define cultural theory. The second part will examine the literature that explores the intersection of cultural theory and design.

3.2.1 DEFINING CULTURAL THEORY

Cultural theory, or cultural studies or critical theory as it is also known, is distinguished as a discipline by its inclusion of a diverse range of concepts to form a cohesive theory, the central focus of which is an on-going analysis of what constitutes 'culture'. It emerges from many different disciplines and philosophies including social theory, anthropology, Marxism, feminism and language theory (Lewis, 2002). However, Lewis points out that it has moved beyond these often rigid frameworks of analyzing culture and society. "Contemporary cultural analysis is formed around a distinct intellectual and cultural break with older areas of social inquiry..." (p. 17). This move away from more traditional forms of understanding society provides opportunities for new philosophical frameworks to emerge. A helpful way to think of cultural theory's break with traditional sociological approaches is to examine the difference between feminist and post-feminist theories, feminism being a part of traditional sociology and post-feminism belonging to cultural theory.

A traditional or modernist approach to feminism is concerned with how women are repressed by patriarchal societies (Tuchman, Kaplan Daniels, and Benet, 1978). While a post-feminist belief is that in this increasingly fragmented world marked by such diversity and multiplicity of experiences, examining one's identity in light of being male or female is not only of very little relevance, it is detrimental. The post-feminist approach has been described by Butler (1990) in *Gender Trouble: Feminism and the Subversion of Identity,* (1990) and in *Bodies that Matter: On the Discursive Limits of "Sex"* (1993). In these two seminal texts, Butler proposes that feminism did itself a disservice by arguing that all 'women' could be classified by one label – female. For Butler, this approach reinforces a binary view of gender relations in which human beings are divided into two clear-cut groups, women and men, leaving little room for autonomy or self-determination.

When applied to design, traditional sociological analysis often draws on feminism and the result is that women are cast as being repressed. This has underpinned many user studies that set out to discover if women are disadvantaged by using technologies made by men. For example, MacKenzie and Wajcman (1999) draw on the work of Cowan (1979) to argue, "The appropriation of technology by men, and the exclusion of women from many of the domains deemed technical, are processes that leave their mark in the very design of tasks ...". They argue that technology has resulted in "the construction of men as strong, manually able and technologically endowed, and women as physically and technically impotent" (MacKenzie and Wajcman, 1999, p.25).

While this thesis is not proposing that gender never matters, the need for the adoption of cultural theory's more progressive approach was immediately evident in the initial interviews. For example, in the first group interview, asking the four female participants if they ever felt that they been disadvantaged by the essentially male orientation of technology seemed redundant. This was because three of the four women were blatantly demonstrating their technological savvyness, having spent the interview surreptitiously texting friends and entering data into their laptops or PDA's. The cynical response to this question from both the female and male participants enforced the idea that as culture evolves so too must the lenses we use to analyze it.

Cultural theory rejects modernist concerns. What then becomes the new focus for analysis? Lewis (2002) provides a chart that marks the break between the modern and the post-modern (see Table 1). He notes that cultural theory is concerned with factors in the right hand column under the banner of post-modernism.

Modern	*Post-modern*
Enlightenment	Post-Enlightenment
Logic Centred	Image/media
Scientific method	Chaos/Quantum
Absolute Truth	Relativism
Humanism/liberalism	Cultural Specificity
Homogenous	Heterogeneous
Europe-centred	Global/multicultural
Universal Laws	Deconstruction
Social structure	Individual pleasure
Industrialism	Post-Industrialism
Materialism	Symbolism
Atoms	Information
Patriarchy	Sexual Fluidity
High Art	Popular Media
Chronology	Time/space compression
Broadcast	Multiple Creators
Reality	Simulation
Conclusion	Inconclusive/language play

Table 1. Modernism versus Post-modernism.
Demonstrates the break between modernism and post-modernism and finds that cultural theory is concerned with the areas under the banner of post-modernism in the right hand column (Lewis, 2002, p.17).

It can be seen that cultural theory breaks with modern sociological analysis by bringing new concerns to the forefront; thereby, introducing alternative frameworks for thinking about culture, technology and what our interaction with it means. These abstract cultural theory concepts can be grounded by their application to the practical act of translating emerging themes into design. As will be discussed in chapter 6, cultural theory concerns (such as those in the right hand column) can provide useful critical lenses for thinking about data. For this thesis 'deconstruction' informed the research covered in the section *Deconstruction (Deconstructing User Studies).* 'Multiple creators' and 'individual pleasure' informed the research in the section *Free-floating Signifiers (Death of the Author/Designer*). The concept of the 'global and the 'multicultural' provided the impetus for the research covered in the section *Looking Towards the Periphery,* while 'time/space compression' and 'simulation' contributed to the observations made in the section *Understanding Digital Space.* Finally, the broad range of cultural theory concepts that examine life in the 'post-industrial age' will be examined in the section *Utopian and Dystopian Outcomes*.

3.2.2 Applying Cultural Theory to User Centered Design

Cultural theory provides a critical analysis of the ways users engage with technology in the context of culture and society yet it is not traditionally used as a methodological tool. Consequently, there is a paucity of literature that investigates its application to the user centered design process. Both cultural theorists and designers note this. From a cultural theory perspective, Barker (2000) argues, "Cultural studies has not devoted itself to the question of research methods and methodology" (p.26). Dourish (2004) from an HCI perspective, notes the scarcity of critical studies in the design process. While there was no direct road map for bringing cultural studies into user centered design, a broader perspective uncovered previous research that indicated it might be beneficial.

The success of Gaver et al. (1999) in applying elements from abstract art criticism to the development of cultural probes hinted that the paring of cultural theory and user centered design might be fruitful. Unlike Gaver's approach however, the use of cultural theory as an analytical lens for examining the data from the user study, was not so much to develop new ways of collecting data, but rather, new ways of thinking about data.

Researchers such as Ito and Okabe (2003) and Hulme and Peters (2001) draw on cultural theory to help explain phenomena in the data with excellent results. They do not however, explicitly map the process through which cultural theory becomes a part of the design process.

The research conducted by Blythe, Overbeeke, Monk, and Wright (2003) is informed by a background in literary and cultural studies. These perspectives come to the fore in the development of new methodological approaches for design in sensitive settings such as 'domestic environments'.

On a more specific level, there is use of the individual components of cultural theory within HCI such as Marxism (Sengers and Gaver (2005); feminism (Cassell, 2002); semiotics (De Souza, 2005) and hermeneutics (Winograd and Flores, 1987).

Agre (1997), in his book *Computation and Human Experience* argues for the introduction of critical reflection to help understand the metaphors within computer science. He calls this 'critical technical practice' (CTP). The notion of CTP was further extended by Boehner et al. (2005) who use CTP to recognize the values embedded in technology:

> As technology literally surrounds us – wireless networks saturating the ether, computers crawling off the desktop and into our living spaces and our bodies, technology shaping the way we communicate, think and reproduce – recognizing the values designed into technology becomes an acute issue (p. 1).

Sengers is one of the founders of the centre for CTP at Cornell University. Her work is essentially a hybrid of cultural studies and HCI. Although her research contributes primarily to the field of Artificial Intelligence, her analysis of the intersection of cultural theory and design is insightful, revealing both the barriers and benefits of collaboration:

> Because of the great differences between AI and cultural studies, it is inevitable that a synthesis of them will include things unfamiliar to each discipline, and leaves out things that each discipline values. In my approach to this synthesis, I have tried to select what is to be removed and what is to be retained by maintaining two basic principles, one from AI and one from cultural studies: (1) faith in the basic value of concrete technical implementation in complementing more philosophical work, including the belief that the constraints of implementation can reveal knowledge that is difficult to derive from abstract thought; (2) respect for the complexity and richness of human and animal

> existence in the world, which all of our limited, human ways of knowing, both rational and non-rational, both technical and intuitive, cannot exhaust (Sengers, 1999, p.3).

Even though Sengers (2000) notes that the merging of cultural theory with computer science is problematic, it can be seen from her research that the convergence of the two disciplines is fruitful. The outcome is a design process where the development of new technology is embedded with an understanding of the culture from where it came, and where it will be deployed.

3.3 SCENARIO BASED DESIGN

In keeping with user centered design principles, the findings of the user study formed the basis of the design implications. This involved two processes. First, the emerging themes from the user study had to be translated into design implications. Second, the findings had to be communicated to the technologists in the SITCRC User Centered Design Project and the SITCRC in general.

Carroll (1997) and Cooper (1999) are concerned with the process through which user needs identified in the study are incorporated by the technical members of the design team. In order to make sure the user needs are understood by the technologists they recommend the use of scenario based design. The approach put forward by Cooper (1999) to scenario based design is also known as 'Interaction Design' and this was the agreed upon method the SITCRC adopted. It involves the use of in-depth user studies and the development of personas and scenarios to embody the findings of the user needs. This makes communication between different members of the design team more efficient and ensures that the needs of the users are more accurately represented (see chapter 7).

A requirement of scenario based design is that in keeping with the Scandinavian tradition of participatory design (Berg ,1998; Bødker, Ehn, Romberger, and Sjogren, 1985; Ehn, 1989; Grenbaum and Kyng, 1991) user needs are continually incorporated into the design process. In doing so, users can contribute to the development of new technology. It was decided that in keeping with this tradition, that the scenarios developed from the user study would be returned to selected participants. In this way the scenarios themselves would become a form of 'cultural probes', thus increasing user engagement in the user centred design process (see chapter 8). Figure 1 demonstrates how user requirements were established and incorporated into the design process. The research process is repeated and the design modified according to additional user needs.

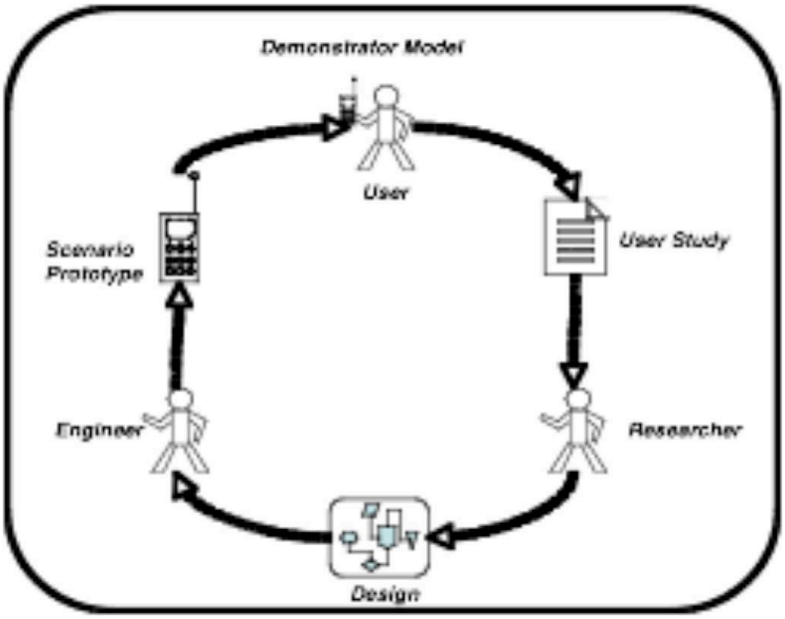


Figure 1. Design Loop.
Demonstrates the process through which user studies led to the development of the Swarm Scenario-Prototype and ultimately a demonstrator model. Each iteration of the Swarm is continually returned to users and their needs looped back into the design process.

PART TWO

USER NEEDS

CHAPTER 4

THE USER STUDY: WHAT DO YOUNG PEOPLE WANT FROM THEIR MOBILE TECHNOLOGY?

Qualitative research helps tell the stories of a particular group or culture. It investigates a phenomenon within its real-life context. It is especially useful when cultural nuances need to be understood, or as Yin (2002) notes, when the boundaries between phenomenon and context are not clearly evident. In this thesis, it was employed to produce data that would tell the story of young peoples' day-to-day experiences with new digital technologies.

The usefulness of adopting a qualitative approach in order to get closer to the needs of mobile phone users is now well documented. The research by Carroll et al. (2002) found that qualitative methods provide insights that might not have been uncovered by other methods, such as psychological assessment of users in a lab. Plant (2001) stresses the importance of these methods when attempting to understand the social and group dynamics of use. While Berg et al, (1998) in the paper "Mobile Phones for the Next Generation: Device Designs for Teenagers", note that qualitative methods, in their case ethnography, "can be used to inform the design of particular interactive features and the form phones might take with the advent of 3G systems" (p.433).

Ideally, the qualitative research component of the user centered design process should establish a relationship between the researcher and the participant that enables the subjects of the study to speak for themselves. Despite some of the other alternative qualitative methods which were discussed in chapter three, such as cultural probes (Gaver, et al., 1999), it was decided to select the open-ended interview technique (Minichello, 1995) for the initial data gathering exercise.

The open-ended interview technique (Minichello, 1995) provides insights into the culture that is being studied by allowing the researcher and the user to engage with each other, although the role of the researcher is more of a listening one. The dialogue helps produce a result where ideally, the participants reveal in-depth accounts of their ideas, opinions and experiences:

> In qualitative research, one interviews people to understand their perspectives on a scene, to retrieve experiences from the past, to gain expert insights or information, to

> obtain descriptions of events or scenes that are normally unavailable for observations, to foster trust, to understand a sensitive or intimate relationships, or to analyze certain kinds of discourse. (Lindlof, 1995, p. 18).

It was hoped that the use of this method for the user study would encourage participants to share narratives that revealed their uses of new technologies in their everyday lives. Not by focusing on the moment of interaction but rather, on the use of technology to fulfill social and cultural goals.

4 COLLECTING THE DATA

Minichello et al. (1995) provide a framework for conducting qualitative interviews. In accordance with their recommendations, an interview guide was developed that covered both general and specific areas of use. The broad areas of questioning combined with more specific inquiry was designed to provide an understanding of the technological practices of the sample group and generate discussion about their attitudes to specific aspects of use. This does not mean that the interview guide was prescriptive or rigidly adhered to. As Minichello et al., suggest, there is a need to be flexible about the order of questions so that the natural flow of the interview is not interrupted. In this way the interview process is 'open ended' and this flexibility provides the participants with the option to direct the flow of the conversation. Discussions that drift away from the original themes are part of the discovery process and when the focus is brought back, it is often with new and interesting angles.

The interviews were a mixture of one-on-one and group interviews. Advertisements placed around RMIT University helped secure the participants, as did word of mouth. Twenty-one individual interviews and two group interviews with seven participants in each group were conducted. The majority of the one-on-one interviews and the two focus groups were conducted in a meeting room at RMIT University. Later on in the process, interviews were also conducted in a number of environments including coffee shops, bars, participants' homes and work places.

The one-on-one and group interviews were taped. Observations were also recorded through the use of field notes. As will be discussed in the next section on data analysis, this was the first step of the coding process and emerging themes became evident almost immediately. The field notes were then incorporated into an introduction that prefaced the start of each interview transcript. Even

though each interview was prefaced with a descriptive heading, the use of field notes helped later on by providing further clues as to the identity of each respondent.

The group interview format was very effective in that the presence of other participants helped users open up and share their experiences more readily than they did in the one-on-one environment. Furthermore, participants provided vignettes of their own experiences that would remind other participants of similar experiences. However, the group interviews had their own drawbacks. In order to ensure rigor the interviews were tape-recorded. Field notes were also taken during the interviews. It was at this stage that the limits of the group interview became evident. Even though the participants were instructed to state their name before speaking, they did not always do this. Moreover, the dominant members of the group would regularly speak over the top of the others, making it difficult to know who was saying what. Although immediate translation of the data helped overcome confusion, there were still instances when valuable data had to be excluded.

4.1.1 Selecting the Sample

Thirty-five participants were interviewed for the study. They fit the following criteria:

- Aged between 18 -30 years old.
- Currently living in Melbourne, Australia.
- Able to demonstrate a reasonable level of technical adeptness with new digital technologies including the Internet, e-mail and mobile phones.

The choice of a sample with demographic variables that included a level of technical adeptness was relevant because it was deemed important that the participants be able to provide informed feedback regarding their use of new digital technologies. However, in the attempt to not disadvantage those in the lower financial economic bracket, connection to the Internet and ownership of a mobile phone was not a prerequisite. It was interesting to note however, that all of the participants did own a mobile phone.

In keeping with the conditions of ethics approval, the minimum age for participants in the study was set at 18 years of age. Defining the cut off point in regards to the maximum age of the participants was more problematic. Leading researchers in the area of youth culture and new

technology such as Livingstone (2000) set their cut off limit for maximum age at 17 years old; however, lack of access to this demographic was not seen to be a huge obstacle. Livingstone (2000) notes the cut off point could be extended to encompass older users because a new generation are increasingly delaying the responsibilities of 'adult life' by continuing to embrace the lifestyles that characterize 'youth culture'.

In order to try and ensure that the demographic was representative across the community in terms of gender, socio-economic status, educational level and cultural background the participants included the following groups. From a gender perspective (a) fifteen males and (b) 17 females. From a financial perspective (a) nine users who earned less than $15 000 per annum, (b) twelve users who earned between $15 000 - $25 000, (c) seven users who earned $25 000 - $35 000, (d) two users who earned between $35 000 - $45 000, (e) two users who earned $45 000 - $55 000 and (f) three users who earned more than $55 000.

From an educational perspective (a) three users had not completed high school, (b) seven users had completed year 12, (c) fifteen users were currently engaged in tertiary education and (d) ten users had territory qualifications. It is noted that 12 of the current territory students and three of the territory degree holders were from RMIT University, making university students and especially those from RMIT University a highly represented group in the study. Although, nearly all of the current students have been involved in part time or full time work during their territory studies, for the purpose of this research, they will be classified as primarily 'students'. When the participant refers to a current university job, this will also be included, for example, 'Fin22, full time student and part-time shift worker in a city hotel'. Users who are not at university will be classified by their occupation, for example, Indigo, 24, event manager, or lack of occupation, for example, 'Matt, 25, unemployed'.

Although all the participants were currently living in Melbourne, the sample included four exchange students including one student from Singapore, one student from Hong Kong and two students from Korea.

The selection of the sample attempted to include a cross section of young users; however, due to logistical restrictions, young people in rural communities were not included in this study. This choice of demographic favors technologically competent, city based users and ignores rural

users and those not competent in the use of new digital technologies. It is acknowledged that this has the potential to shape the outcome of the data and hence, the final results.

4.1.2 The Interview Guide

The initial interview guide (see Appendix A Interview Guide for complete list of questions) was designed to gain a broad understanding of how the participants engaged with new digital technologies. It started off with basic questions that related to the following areas:

- Frequency of use.
- Reasons for using technologies.
- Range of technologies used.
- Importance of technology to day-to-day life.

More specific questions were then introduced that covered the following areas:

- The Internet
- Mobile Phone
- Virtual Communities
- Customization
- Using technology as intended or not as intended
- Content production
- Ideal future technology
- Empowering or disenfranchising aspects of technology
- Privacy
- Security

Despite the opportunity to discuss a wide range of technologies, the responses of the participants were highly concentrated on mobile phone use and this led to a shift in focus of the overall research. The interview guide was slightly modified in accordance with this; however, the mobile phone was rapidly converging with other technologies and so the relevance of including other technologies remained.

4.1.3 Incorporating the Users' Perspectives

The flexibility of the open-ended interview allowed the participants to actively contribute to the direction of the discussion. In some cases the interview guide was abandoned as participants led the discussion, providing detailed analyses of the role of mobile phones in their everyday lives. The open–ended interview process was also an effective means for making the research process rewarding for the participants.

Five users from the study spontaneously re-engaged with me over a period of months after their interviews had been conducted, phoning, e-mailing or even text messaging me with sudden new insights about how their mobile phone should be changed to make their lives better. Eventually, this involvement of the participants in the study was taken further with four of these users being engaged in the development of scenarios (see chapter 8).

4.1.4 Managing the Data

In order to begin the process of analyzing the data from the user study, each interview had to be transcribed into digital text. The files were then introduced into NUD*IST 6, a computer program for the analysis of qualitative data. NUD*IST 6 was used to aid in the management of the data during the coding, the process through which the data is analyzed for emerging themes.

The use of NUD*IST 6 was helpful for testing the conclusions as it allowed for easy identification of negative case studies. Later, it would provide a helpful reference for accessing all of the user quotes.

4.2 Initial data analysis

The nature of the user centered design approach required the technical members of the team to not only work in collaboration with the sociologists, but also to develop new technologies that had as their basis a clear understanding of the users for whom they were designing. The reality of this was that quick results from the user study were needed. In order to meet these challenges, grounded theory Glaser and Strauss (1967) and Strauss and Corbin (1990) was called upon to provide a 'quick and dirty' snapshot of user needs Hughes, Kyng, Rodden, T and Andersen, (1994). This meant the technologists within the SITCRC User Centered Design Team had a rapid, general, but informed sense of the users and settings they were designing for.

The data was not scrutinized in minute, line-by-line detail as specified by Glaser (1967). Rather, the analysis was treated more as a means of gathering initial user requirements. As each interview was transcribed, it was examined broadly for user problems that might be emerging. As will be discussed in the upcoming chapters, more analysis would occur at a later stage, during the translation of emerging themes into user needs and then into scenarios.

Once the emerging themes had been identified a matrix was developed (see Table 2 for a sample of the matrix and the see Appendix B for the full version). It was used to map the main observations that came from the data. Although NUD*IST 6 was a useful tool for managing the data, it was the printout of the matrix of 'emerging themes', 'explanation of the themes' and 'number of users represented by the theme' that proved the most useful. This was relevant not only for the thesis writing process, but also, as a reference when meeting with the SITCRC User Centered Design Team.

Meta-Theme Two: Spontaneous Formation of Social Networks

Emerging Theme	Explanation of Theme	Users
Mobile facilitated fluid interaction (swarming)	Mobile phones provide a fluidity and spontaneity of interaction through access to a digital, networked, social world.	27
Blurring the boundaries between real and virtual interaction	There is a sense that users are always connected with each other. This enables them to switch seamlessly between real and virtual environments.	22
Interaction only occurs in the context of regular face-to-face contact	The high level of comfort users experienced moving between the virtual and real world of mobile facilitated interaction exists only in the context of pre-made, real life friendships.	22
Scheduling – as an activity in itself (the approximeeting)	The nature of mobile technology is such that it lends immediacy to the formation of social networks, and the outcomes of this, is that the act of scheduling itself becomes an important and pleasurable activity. So rather than just meeting a friend, the physical meeting is anticipated with a series of text messages and mobile phone calls.	18
Maintaining virtual presence	Users in the study who report that there were times when they were so regularly exchanging scheduling orientated text messages that they were providing a continual update of their day- to day activities.	26

Table 2. Provides a sample section of the matrix that maps major (meta) themes, description of theme and number of users the theme represents.

CHAPTER 5

EMERGING THEMES AND USER NEEDS: WHEN FACE-TO-FACE SOCIAL NETWORKS GO DIGITAL

This chapter presents the emerging themes from the user study (Satchell and Singh, 2005). It is revealed that the social dynamic resulting from the use of mobile phones has created a huge paradigm shift that has indelibly changed the nature of inter-human relations. Mobile facilitated interaction is driving a fundamental change in social mores with respect to engagement and commitment, to notions of fluid time versus fixed time and ultimately to urban mobility. Connectivity is becoming central to what it means to have a social identity and users are responding to this by merging bits of data to create their 'ideal digital self' through which they communicate socially. This calls into question the nature of 'digital identity'[1], indicating it is not only about how much information can be restricted, but rather, what is revealed. Finally, it can be seen that the mobile phone is facilitating rich content production as social communication.

5 FIVE EMERGING THEMES

The findings can be best thought of in terms of the five main themes that emerged from the user study:

1. Archetypes
2. Spontaneous Social Networks
3. Connectivity and Control
4. Identity
5. Content Production as Social Communication

[1] It is significant that in the domains of computer science, digital identity is most commonly thought of in terms of anonymity. This is for security reasons in that the less information the user reveals, the less vulnerable they are to digital crime such as identity theft.

The first theme relates to distinct user archetypes that emerged from mobile phone driven sub-cultures. These archetypes are identified as the nomad, iconic, updater and resistant user. They provide metaphors for understanding the process through which technology and youth culture meet. Later, they will be helpful in the early phases of the design process.

The second theme looks at how young people are using their mobile phones for the spontaneous formation of social networks and examines the emerging hybrid of digital/real-time relationships, what Ito and Okabe (2003) call the 'augmented fleshmeet'. This behavior has led to the emergence of 'passive scheduling' as a form of social communication and as a means for maintaining presence.

The third theme reveals that the mobile phone is creating a generation of conflicted users trying to balance the need for connectivity with the desire to be at times, uncontactable. This results in users putting mechanisms in place to exercise more control over digitally constructed mobile space. The need to be able to convey meaning without real time interaction was the most commonly cited improvement that users wanted for their mobile phones.

The fourth theme is concerned with how the social dynamic resulting from mobile phone interactions is driving the notion of identity, leading to a youth culture where connectivity itself has become a defining part of what it is to have a social identity. This results in a culture where interpreting or reading other peoples' digital identities provides a means of establishing what a person is like. This calls into question the nature of identity itself.

The fifth theme is that users are creating and sharing their experiences by becoming creative content producers rather than passive receivers of technology. Furthermore, they are taking advantage of the convergence of 3G phones and the Internet to create and mix bits of multi media content together in order to communicate through a dynamic blend of sound, text and images. However, there is a distinct problem arising in that users are finding it increasingly difficult to manage their content, protect its privacy and share it spontaneously.

5.1 Emerging User Archetypes as Metaphors

Four distinct archetypes of users emerged from the mobile phone driven subcultures of youth culture:

- Nomads
- Iconics
- Updaters
- Resistants

These archetypes provide useful metaphors for understanding youth culture and the central role technology plays in it. As Sawhney (1994) points out, "We have to accept the fact that although the use of metaphors is not a particularly elegant or sophisticated technique, it is perhaps the only conceptual tool that we have for understanding the development of a new technology" (p.293). These archetypes will also be useful for creating personas, which as discussed in the next chapter, help the process through which emerging themes from the user study are translated into design (Cooper, 1999).

5.1.1 NOMADS

The 26 nomadic users in the study were characterized by always being on the move between different groups and activities. Furthermore, they were nomadic in that unlike previous generations they did not have centralized meeting places where they could get together. They were disconnected physically, leading fragmented lifestyles as discussed in (Carroll et al., 2002) and were often without a consistent home base. However, because they are connected virtually via their mobile phone handsets and networks, they can seamlessly map their own journeys through a continual series of activities and events. This is in keeping with Deleuze and Guattari's ideal of the nomad who is characterized by freedom of movement and is not constrained by time and space: "One can rise up at any point and move to any other" (Deleuze and Guatarri, 1987, p.xiii).

The nomadic users found cohesion in an otherwise fragmented life through their use of mobile phones. This can best be illustrated by statements that John[2] (22, part-time student and part-time human resource consultant) and Finn (22, full time student and a part-time shift worker in a city hotel) gave during their interviews.

[2] Each participant has been given a pseudonym.

John describes the process through which he uses his mobile phone to control his increasingly fragmented real world activities:

> I am constantly in contact virtually with colleagues and peers and friends. I use communication tools, e-mail and phone equally for social activities and for work - maybe more for social activities. Because of my technology I am always able to be part of what's going on in all aspects of my life. I have more control in a digital world than in a real world, but the digital world helps me control the real world. What I'm saying is that if I didn't have my phone to coordinate it all I would start slipping up and not meeting my social or professional obligations.

For Finn, living in a share house provides no sense of a central point of contact. Instead his mobile phone fulfills this purpose:

> I am good mates with the people I live with, I have known them since year ten at school, they are really top guys but they don't understand how to take a (phone) message. That's ok though, I mean that's what answering machines are for right? WRONG! Having an answering machine relies on there being someone that makes sure the messages get listened to and given to the person who the message is for. Then the tape needs to be rewound so the messages can keep coming in and being recorded. This just doesn't happen at my place. The tape gets rewound yes, but no one wants to write down every message. So the person calling, for example my girlfriend asking me to come over, or my boss telling me that I had the extra shift I asked for, thinks that they have got through, but in reality, I never get the message. So I'm risking being dumped by my girlfriend and being sacked by my boss. In the end we got rid of the answering machine, then the phone got disconnected and we just now all use our own mobiles. I spend more time at my girlfriend's house now and am doing extra shifts so I'm hardly ever at home anyway, at least my mobile, which is ALWAYS with me gives me some sort of feeling that I'm not just all over the place. My phone got stolen not that long ago and those few days in between phones were intolerable.

It can be seen that for this archetype of user, the handset becomes like a surrogate home base or virtual lounge room from where the nomad can maintain a continual virtual presence, summoning, or joining real and virtual groups at will. As shall be discussed in the section on social networks, this represents a paradigm shift in urban mobility not seen since the car liberated a generation of teenagers in the 1950s.

5.1.2 ICONICS

Pankraz (2002) points out a 'global youth culture' which is being driven by technology, rather than fashion, music, and sport as in previous generations. This was, to varying degrees, true for all the users in the study. For example, 33 of the 35 users customized the look and/or sound of their mobile phones to reflect their taste and style. For these users the mobile phone has transcended its functionality as a communication device and has become an icon or status symbol. Twelve users actually spent more time changing the look and sound of their phone to reflect their current mood than they did talking or texting. Hulme and Peters (2001) draw on Baudrillard to look at the process through which it was possible that the mobile artefact has become appropriated by youth culture as a defining icon for their generation (see chapter 2).

Essentially, the mobile phone has become a free-floating signifier, where the meaning that is produced by the artefact has come unmoored from what it traditionally symbolizes (Barthes, 1977). Hence, the mobile phone no longer just represents communication, rather it has become symbolic of the owner's status, and social acceptance and popularity (see chapter 6).

It is significant that two users in the study deliberately shunned new developments in mobile phones in favor of 'old school' or 'brick' models. "I don't want my technology shiny and new; I want it organic or at least a brick" (Nina, 18, student). This choice of the mobile phone as the site for an anti-aesthetic statement, illustrated that whether it be in celebration or rejection of its form, the mobile has become an artefact for the expression of taste for every user in the study.

5.1.3 UPDATERS

Plant (2001), likens mobile driven phrases such as 'on my way" or "on the bus" to global dance tracks. She proposes that "Where are you?" is the perfect mobile question and "On the mobile" is the perfect mobile answer (p.29). This question is fundamental to mobile telephony, and distinguishes the difference from land-line based communications by providing the possibility that the caller could, indeed, be anywhere! This has not only created a need for users to position and re-position themselves at the start of every phone call, but given way to a culture of use where the dominant part of the message relates purely to the activity or location and no further information is

supplied. This is the 'updater' – representing 26 users, (22 nomadic) for whom mobile phone ownership goes hand-in-hand with a need to regularly update others of their actions.

The updater archetype highlights the way mobile technology allows users to maintain a virtual presence in each other's lives, creating a new generation of 'always on' friends. This is also related to Moblogging (mobile blogging) although it is also subtly different in that updaters only broadcast within a strictly walled network of users, while Internet bloggers disseminate the digital account of their lives on the Internet.

The updaters place a lot of importance and derive much pleasure from documenting, circulating and consuming digital accounts of day-to-day experiences. They become active content producers rather than passive consumers of technology and use their own experiences to create new consensual meaning. This will be discussed later in this chapter in the section on content creation.

It could be seen from the 'updaters' in the study that users want to maintain a digital presence in each other's lives. Five users suggested that just like in gaming, avatars are an ideal way of maintaining this virtual presence.

Finally, mobile technology is rapidly converging with other technologies such as digital cameras and the Internet. This coupled with the advent of 3G networks and handsets sees 'updaters' creating increasingly sophisticated home produced multi-media content to share their experiences.

5.1.4 RESISTANTS

The archetype of the resistant user revealed that while 33 users expressed affection, attachment, and identification with their mobile phones this did not translate into an unqualified embrace of a lifestyle generated by mobile technology. In fact 26 users said that they hate their phones. What then was to be made of this inconsistency of 26 resistant users? After much consideration of the data (see chapter 6) it could be seen that users are resistant to ubiquitous mobility, desiring connectivity but then not satisfying their need for being unreachable. This was encapsulated by one user's attempts to resist the mobile presence of her friends:

> I turn it down so I can't hear it ringing, but then I can see it flashing. I try and look away but I can still see and sense it and I just stop concentrating on what the person (I'm

> with) is saying. I usually even know who it will be on the other end – and they know that I know. Then they hang up, it stops flashing and I can go back to being part of the conversation. Then 30 seconds later it starts flashing again. After about five missed phone calls I actually start to worry, maybe it's some sort of emergency, so the next time it flashes I look at the screen to see who it is and sure enough it's the person I thought it was – just being demanding and wanting my attention right now. (Holly, 23, journalism student)

For two of the participants, resistance to mobile phone ownership was purely financially driven. These two users rarely used their phones for social purposes; rather, connectivity was inextricably linked with security. This resulted in the reluctant financing of a mobile phone as if it were a health or travel insurance policy. It could be concluded that users are happier to pay for mobile phones when they are used for social interaction than if they are for security purpose

5.2 Spontaneous Formation of Social Networks (Swarming)

Mobile phones provide a fluidity of interaction through access to a digital, networked, social world. For 26 users in the study, this resulted in a reality where technology and friendships are inseparable from each other. "Technology has increased my intimacy with my friends. It gives me the power to be part of the group whenever I want. I never turn my phone off" (Holly, 23, journalism student).

For these users the main reason to own a mobile phone is for the formation and maintenance of social networks. Long term plans are rarely made giving way to spontaneous encounters. Twenty-seven of the participants in the study rarely planned to meet up, rather they gathered spontaneously on a minute-by-minute basis. This was only achievable because of the user's mobile phones. Lucie (18, student) noted; "I couldn't live without it because then I would have no friends. I mean I would have friends but how would I find them?"

This sense of always being connected and immediately available has bought about a huge cultural shift. Connectivity frees users from the constraints of the need for a physical locale as the mobile phone becomes the user's virtual home base. "The one place that you can always find me" (Callum, 27, IT consultant).

5.2.1 Blurring the Boundaries between Real and Virtual Interaction (Augmented Flesh Meets)

For 22 users with the sense that they are always connected with each other comes from the ability to switch seamlessly between real and virtual environments. As one user described:

> I will usually send a text saying that I am on my way, even when my friends would know that. Often we start our conversation (via text) before we physically hook up…I don't mind how I catch up. I would probably prefer to catch up virtually because I can do so from the comfort of my place. But then again usually one sets up the other (Andrew, 25, musician).

Furthermore, a group of friends gathered in real life will frequently be joined, via mobile phone, by someone that is known to the group. The incoming call or text then becomes a new focus for the conversation. This indicates that the mobile phone lends a new dynamic, opening up the social space to include those not present. Ito and Okabe (2003) call this the 'augmented flesh meet':

> Mobile phones have become devices for augmenting the experience and properties of physically co-located encounters rather than simply detracting from them. Teens use mobile phones to bring in the presence of other friends who were not able to make it to the physical gathering, or to access information that is relevant to that particular time and place. The boundaries of a particular physical gathering, or flesh meet, are becoming extended through the use of mobile technologies, before, during, and after the actual encounter. (pp.17-18)

It can be seen that rather than alienating other members of the group who are there physically, the 'augmented fleeshmeet' can create new sites for enforcing intimacy.

5.2.2 Interaction only Occurs in the Context of Regular Face-to-Face Contact

The high level of comfort users experienced moving between the virtual and real world of mobile facilitated interaction exists only in the context of pre-made, real life friendships. This makes mobile phone supported interaction very different to that of other virtual worlds, such as gaming or Internet communities where, at least in some cases, users traverse time and space in order connect with people they have never met in real life. Of the 22 users who revealed that there is an almost equal satisfaction to be got from mobile phone interaction as there is from real life interaction, all point out that this is only with people that they see regularly in face-to-face situations:

> At least when I'm texting my friends (as opposed to communicating with them on the Internet) my parents know that I'm not talking to people I don't know because nobody would use their mobile phone to talk to strangers. (Genevieve, 18, student)

This conception of the mobile phone as a private mode of communication provides users with a barrier between themselves and those outside their network. Only two users said that they would regularly interact with people they don't know in a virtual environment. The first person was Andrew who said he would only do so as an extension of his addiction to online gaming and Kara who regularly participated in MUDS.

5.2.3 SCHEDULING – AS AN ACTIVITY IN ITSELF (THE APPROXIMEETING)

The nature of mobile technology is such that it lends immediacy to the formation of social networks. The outcome of this is that the act of scheduling itself becomes an important and pleasurable activity. Rather than just meeting a friend, the physical meeting is anticipated with a series of text messages and mobile phone calls:

> There is no such thing as an organized get-together, or if there is, the time and location will invariably change. Even something like going to the movies cannot happen without 20 text messages - three changes of cinema and five different possible movies (Bart, 28, sign writer).

Eighteen participants used what they consider 'dead time' to engage in scheduling. Definitions of dead time included being on public transport (17 users), waiting in queues (8 users), lectures (3 users), and driving (15 users). Rather than finding this type of interaction an intrusion, 22 users found the scheduling based dialogues rewarding:

> Even at work I'm constantly organizing to do things with my friends. I go back and forth between windows at work, it's like a work document, e-mail, work document, text message, work document, mobile phone call. Then I leave work, double check my mobile messages, send a few texts (Indigo, 24, event manager).

The intense mobile interaction is creating a new genre of social communication, with five users stating that they prefer the scheduling to meeting:

> Sometimes the actual meeting is not as good as the planning – and even when you do meet, you're too busy organizing to meet with another group of friends to pay attention to the people that you are with (Manny, 23, part-time student).

It can be seen that the 'aproximeeting' is significant in that it embodies a huge cultural shift, challenging traditional ideas of the nature of engagement and commitment.

5.3 CONTROL: MAINTAINING BOUNDARIES OF VIRTUAL SPACES

Connectivity provides mobile phone users with a sense of reassurance; however, with this, comes the consequence of vulnerability due to unwanted calls. Users try to protect themselves against this seemingly contradictory dynamic of openness vs. isolation. Essentially, the mobile phone is creating a generation of conflicted users trying to balance the need for connectivity with the desire to be at times, uncontactable.

Maurice, 23, a sales rep for a pharmaceutical company talks about how the phone can intrude on his life and the mechanisms he puts in place to try and control it:

> Good old caller ID. It helps stops my phone being a total pain. I look at it and know if I want to answer it or not. All the people I want to talk to are listed in my phone so I can see which name comes up and know if I want to answer it or not. But then there are those calls that come in 'number unknown'. I hate that because it's just a lucky dip. It might be someone I want to talk to calling from their home phone; Optus home phones for some reason always seem to come up 'caller unknown'. Of course when I'm at work there is no choice but to answer every call. My job actually pays for my phone and all my calls, even my social ones so it's my obligation to make sure that I answer it during business hours, but when it's past 6pm on the weekend it's another story. One thing I think that is going to be a huge problem is video phones, there are certainly things I wouldn't want to see.

John also supports this view of wanting to control where and when communication occurs. “I love caller ID – I talk to certain people at certain times. It does make me have better relationships. I would rather converse when I feel like it, not when I am tired or watching TV.”

Tanhock is from Singapore. He is an international student studying full time in Melbourne. He notes that with e-mail you can have multiple e-mail addresses for friends, family and work. This makes having control over your digital space easier. Unless you have two or more phones though, it is harder to impose these divisions over the digital spaces:

> The good thing about using e-mail is that you can have different e-mail addresses for friends, family and work. There is less chance of making an embarrassing mistake if you have these sorts of divisions. I can pretty much send a group e-mail within a group but heaven forbid those e-mail worlds should collide! With a mobile phone it’s much harder to make these sorts of divisions. In Singapore, carriers offer different services. Some offer free incoming calls (unlike in Australia in Singapore most Telcos do not allow users to receive calls for free.) and other carriers offer free SMS. So it started to happen that people would have two phones, one for SMS and one for incoming calls. But then having these two phones gave you the opportunity to start segmenting, you know, one for work, one for friends. I know that in the end I loved having a phone dedicated for one purpose and I would segment them in just that way and not worry about the cost savings. It was a hassle to carry around two phones though, but, for example, on the weekend you would just bring the friends’ phone out with you or while you were at work you would bring the work phone, This way you didn’t have the friends calling you at work and vice versa.

It can be seen that while users desire the fluidity of social interaction that mobile phones afford them, they also resent their intrusion in their lives and are seeking new ways to exert control over digital space, and reduce unnecessary contact. As shall be discussed shortly, one of the ways in which they are doing this is to use their mobile phones to convey meaning.

5.4 Connectivity vs. Contactability

A re-occurring problem for users in the study was intrusion. Twenty-six participants responded that their own mobile phone was a regular intruder in their lives. Eighteen users responded to this problem by carefully policing the boundaries of the digital world, for example, not

answering a call if they did not recognize the caller. As Indigo noted, "I would rather let it go to message bank then call whoever it is back even though it means I have to pay twice, once for the message bank call and then again to call the person back." Furthermore, 23 of the participants said that there were times when even if they recognized the caller they would rather let the phone deal with it and let it go through to message bank.

It is significant that these complaints about mobile intrusions were mostly in regards to incoming calls; the less intrusive text message was only cited by three users as a source of annoyance. This was encapsulated by a participant in the study who explained that her ideal interaction with friends is improved through the barrier of technology:

> If I have a friend over, we will both sit here doing exactly the same thing except that then I have to make concessions as to what we do. I would prefer to have a friend online, then I could just keep them in a minimized window most of the time (Lucie, 18, student).

5.4.1 Conveying Meaning without Communicating

Twenty-four of the participants in the study agreed that even when a phone call is not answered the status of the phone itself reveals a lot about the current availability of the user. For example, a phone that is switched off indicates the person is not in social interaction mode. A phone that is turned off mid-ring indicates either that the person is engaged in an activity where it is not appropriate to talk, or a deliberate rejection of the caller. A phone that rings out or goes to voice mail is seen to mean that the person is willing to be contacted but cannot get to the phone at that particular moment. It is an indication to try again soon. One user stated:

> Sometimes it is nice to just go out of circulation. When I want to do that I just turn my phone off and people see that and can tell that I am not interested in catching up. The problem though, is sometimes my phone goes flat and I end up sending the 'out of circulation message' when really I am just out of battery (Lucie, 18, student).

Twenty participants responded that they would like this concept of conveying meaning without having to directly communicate to be developed further. Currently, the act of turning the ringer down or rejecting a call are unpleasant relative to the message we are trying to convey, and there is a need to be able to change fluidly between these states or modes.

5.4.2 Maintaining Virtual Presence

Ito and Okabe (2003) use the 'ambient virtual co-presence' to explain the way in which users maintain a continual presence in each other's lives via text messages. These messages are predicated on the sense of ambient accessibility, a shared virtual space that is generally available between a few friends or with a loved one. They do not require a deliberate "opening" of a channel of communication, but are based on the expectation that someone is in (virtual) 'earshot'" (p.14).

This was in keeping with 26 users in the study who report that there were times when they were so regularly exchanging scheduling orientated text messages that they were providing a continual update of their day- to day activities. It is significant that the nature of the exchange is such that the message does not necessarily require a reply; rather, it becomes a way for friends to maintain a presence in each other's lives. Their data revealed that this sort of communication is often of quite a mundane nature, like a sort of virtual 'small talk'.

5.5 Identity

A central theme in recent studies by Taylor and Harper (2002) and Howard et al. (2002) is that the importance young users place on expressing their social identity in the real world extends into the digital world. For 24 users in the study interpreting or reading other peoples' digital identities provided a means of identifying what the other person was like. As one user stated, "Their synthesized persona is quite revealing" (Callum). Similarly, users indicated that they derive pleasure from creating a digital identity that reveals the persona they wish to convey.

5.5.1 Ideal Digital Self

It can be seen that users want to use technology to create digital identities that have characteristics that satisfy psychological needs and desires. This indicates that creating a digital identity is not only about how much information can be restricted but rather what is revealed. Indigo (24, event manager) points out; "It's cheaper to look good on the Internet. I can't afford a Fendi handbag but I can make my online persona look wicked. "

Creating the ideal digital identity is important for design because as will be discussed shortly, it illustrates that identity should not just be thought of in terms of how anonymity can be enforced (Satchell et al., 2006) Rather it should be thought of in terms of the new dynamic ways that mobile phones allow users to express themselves. The user study found that young people are taking advantage of 3G telephone systems and the Internet to produce and merge bits of data to create their 'ideal digital self' through which they communicate socially. This means that instead of voice or text, users are communicating through a hybrid of still and moving images, sound-bytes, symbols and logos. This is in keeping with the observations of Counts and Fellheimer (2004) that "Lightweight photo sharing, particularly via mobile devices, is fast becoming a common communication medium used for maintaining a presence in the lives of friends and family" (p1).

Callum, (27, full time student and a part-time shift worker in a city hotel) described how he wanted his online identity to be a pastiche of pictures, text and sound:

> I merge lots of different pieces of data to create the one single identity for a specific purpose. That is what is good about doing things on the Internet. Why just be text when you can be multi-media? I have just started becoming multi-medium too because I have got a picture phone and I e-mail from it.

5.5.2 Choice of Technology an Expression of Identity

The study reveals that for young people their choice of how they send and receive a communication message is one of the most potent means by which they can express their identity to their peers. For 24 users, the choice of technology could convey as much as the content of the message itself. For these 24 young people the use of different modes of technological communication is not just to facilitate different activities; their choice of the technology is an expression of their identity. Furthermore, because identity is mutiplicitous and shifting rather than singular and static, the way in which the users want to express themselves relates to the context of the exchange, the environment they are in and the nature of the relationship with the person they are communicating with. As one user stated, "the type of message you send says as much as what's in the message" (Callum). This was supported by Evan:

> The way I use technology or bits of it is dictated by what and how I want to communicate things and how I want the message to get across. Particularly with e-mail I use a different identity depending on who I am communicating with. Sometimes I use

> my degree next to my name in e-mails but not for friends. I will get rid of all the info that personalizes my e-mail and use nicknames. I have five or six different e-mail identities and I have that programmed in. I can even choose different signatures for each one. By being able to switch between identities I reinforce the message (Evan, 28, environmental scientist).

This was also supported by Bart (28, sign writer) who describes not only how he placed a lot of importance on how he constructed his own digital identity but also on the way he judged others by their 'digital appearance':

> The way in which I come across is really important to me and I don't want to be represented by some daggy font. If I meet someone and get their e-mail address and then get an e-mail from them and they have a really bad e-mail address or the set of their e-mail looks really bad or if they are full of emoticons – then I will actually think less of them. I think that if you can't get your digital identity right then you are not going to be much in real life. In real life you can spend a fortune and look great but on the Internet you have to be more creative. If you just don't get it no amount of money will help you. It's not like there are personal stylists to make you look better online.

As users are spending more time in digital environments and putting more effort and energy into how they appear, the boundaries between two worlds are blurring. Rheingold (2002), in his book *Virtual Communities* noted interaction within virtual environments can be as fulfilling as interaction in face to face communities. Essentially, this suggests a blurring of the boundaries between real life and digital identity.

Andrew (25, musician) in the following excerpt from his interview provided an interesting account of this concept in relation to multi player gaming. He noted that he could tell what the other person was like without having ever having met them in real life, game play itself becoming a non verbal communication discourse. He also points out that he spends so much time in virtual worlds that he feels it is necessary to make the distinction of Real Life as opposed to Virtual Life. He concluded that gaming interaction is unique however, in that otherwise he wouldn't associate in virtual environments with people he didn't know:

> Andrew: I play a lot of Half Life and Counter Strike. I can tell what the other person is like just by their style of game play. You can tell so much about someone from the way

they approach a game and the moves they make. I have made friends with gamers and I feel I know them really well, but I have never met them in RL.

Interviewer: What do you mean by RL?

Andrew: Real Life. I have to make the distinction you see because the concept of 'real life' is actually more foreign to me than 'virtual life' I spend more time in virtual environments, so that's my reality. I even do my socialising within the gaming environment, so I will be playing against friends that I see in real life on the weekends, and we will be mid-game and using the function that lets you communicate through text and rather than just trash talking to each other about how many kills we have, we are working out what band we are going to go and see.

Interviewer: Would you organise to meet up with gamers that you didn't know in real life?

Andrew: No probably not. There is no need; the game play exchanges are revealing and authentic in their own. There is no need to meet up.

Interviewer: Would you make friends in chat rooms for example?

Andrew: No, probably not. I kind of need the activity of gaming. If I just wanted to chat I would to talk to my real life friends.

5.5.3 'CONNECTIVITY' AS A DEFINING CONCEPT OF YOUTH CULTURE

The social dynamic resulting from mobile phone use has driven and redefined the notion of identity. From the user study it can be concluded that 'connectivity' itself has become a defining part of what it is to have a social identity. An extension of this is that users place a great deal of importance on constructing their own digital representations. As Myersen (2001) notes, the mobile phone is the device by which one conveys to their peers that they are an active participant in early twenty first century society.

On a practical level the mobile phone facilitates communication; however, for 26 users in the study, mobile phone ownership also provides a sense of social and cultural identity, connectivity being an integral part of what it is to be a social individual in the early twenty first century. "We are

like bees that need to communicate. It is a defining part of what we are like. We need to communicate and will become even more like this as the technology improves" (Andrew).

A participant in the study noted, "There is just no excuse for not being contactable" (Andrew), embodying how connectivity is becoming 'perceived' as a fundamental day-to-day need. As Hulme and Peters (2001) explain:

> The mobile has many functions, not only as a communicator but also as a signifier for identity…Connectivity will not only influence their patterns of mobility but will also influence their identities and how they see themselves. (p. 2)

The natural extension of the users' desire for connectivity was, for 20 respondents, a fear of being disconnected. "I cannot bear to be out of the loop even for a minute" (Lucie). This was supported by the DoCoMo No.10 (2001) study which found that the main criticism young people have in regards to their mobile phone is that they are not able to offer truly ubiquitous mobility. The most desired improvement for the users in the DoCoMo study was that their phones could allow them to "call from anywhere" and have batteries that didn't need to be continuously recharged "so they wouldn't be stranded" (p.1). Indigo notes;

> My phone makes me feel safer. I will call my boyfriend if I have one at the time, or even my mum, if; for example, I leave work late and am going into the underground car park. I know what it is like to have a mobile phone and I know what it's like not to have one and believe me the world is a much safer place for a girl when she's on the phone to someone. I will actually say – "OK, I'm going down into the car park" and if I suddenly get attacked, well then Mum, or my boyfriend of the time can send help.

Bridgett, 19, is a part-time student. She describes how she feels strongly 'connected' to a digital network, feels empowered by this connectivity and would go to great lengths to maintain it:

> When I am on my own I feel safer with my mobile, because it means that I am never on my own. (This is exactly what Sadie Plant (2001) said – I'm not alone I'm with my phone) I hate being out of range. I feel very uneasy when I start to see those few little bars of coverage disappear. As soon as I see those little bars on the side start to disappear I start to worry. It's not that I have to talk to people all the time, it's that I need to know that I'm connected to a network. You know things like 911, I mean 000.

> But its not even really emergency services although I like to know that they are there. I just need to be connected, I guess. One time I was at a friend's house in the mountains and her place was in a valley and there was no reception at all. I ended up spending half the day climbing up this mountain to try and work out if there was any coverage at all in the area. There was, and once I worked out where it was I felt better. So having no coverage is OK as long as you know where you can get it.

5.6 Content Production

For 26 participants in the study, mobile phone ownership goes hand in hand with a need to regularly update others of their actions - to document and circulate their experiences. There is a sense that an experience is not complete until it is shared digitally through text, voice or images. Through this sharing, of what is essentially content, friends are able to maintain a presence in each other's lives. When members of a social group cannot be together physically, circulating digitized accounts of an activity becomes an authentic way to share the experience. Furthermore, once sent, the message often has value for the receiver and 16 users in the study said that they archive significant or sentimental messages and images in their phone. It can be seen that sharing content – such as up to the minute videos of what users are doing 'right now', is a very desirable feature.

Bart, 28, is a sign writer. He prefers to communicate through images rather than words so has embraced the picture capabilities of his new phone. He loves the immediacy that this represents although finds that incompatibility and cost are a factor:

> I would much rather communicate through images – there is less confusion this way. I would rather send a picture through my phone of what I was doing to try and get my friends to join me than I would describe it in a text message, or send a picture rather than a written description of my weekend. I find that the picture of a pot of beer, sent to my mates at about 5pm on a Friday communicates volumes. I used to do that when I was at my desk and e-mail it around, but I'm out on different sites most of the time so it was pretty rare that I could that. Now that I've got a picture phone there's no stopping me. Oh well, that was until I got my phone bill. They cost way too much to send. And also there are some problems sending it to phones that are on other networks. When it works so well though is when you are out, and trying to get someone else to come, you just take a picture of a hot chick that's there, send it to your mates and they are at the pub in five (minutes).

5.6.1 'Cut and Paste' Multi Media Content as Social Communication

In order to create more dynamic digital identities seven users reported that they are using a 'cut and paste' approach to communicate through content. "I take digital photos and videos with my phone, then I e-mail them to my computer, download songs, attach it all to an e-mail and send it to my friends." While another user stated, "I can listen to my voice mail messages on the Internet, then I can save them and use them as samples. I can then e-mail them back to friends and include pictures of them, or bits of their favorite song or something as a birthday a present." This is reminiscent of the behavior of text messaging that (Taylor and Harper 2002) reported, where a text message was not so much about what it said, but as an expression of friendship.

When applying for jobs on the Internet, Callum augments his digital resume with elements that provide a more personal touch that shows rather than tells potential employers that he is a creative person. For example, he will add a series of photos and MP3 file of a music track he has composed:

> I would not dream of applying for a job on the Internet when I just sent off the same sort of resume that I would in real life. The whole point of doing it online is that you can represent yourself far better than you could on a piece of paper. I want to send something that when they open it they hear an MP3 track I have composed, I want them to see an image first not just text and I want to have footage embedded of projects I have worked on.

5.6.2 Maintaining Control of the Privacy of Content

The participants in the study were concerned with privacy and security in that wanted control of the boundaries of their virtual worlds. This meant they did not want to have to indiscriminately field text messages and phone calls all the time. Furthermore, participants responded that they felt very strongly about the protection of their content. For example, of the six users who had a security code on their phone, only two had it primarily to stop other people using the phone to make calls. The other four had the security code activated to protect people from looking at their texts and images. One of these users said that she guards her text messages more closely than she does her Internet bank.

While users enjoyed using multi media content as a form of social communication, 17 users in the studies explicitly stated that it is content that they have produced themselves that is the most

important to protect in terms of privacy and security. One user in the study said she is more concerned with protecting the privacy of the digital pictures on her phone than she is with protecting her Internet banking details. Other users indicated that a major concern with sharing content is making sure that only the intended people see it. These privacy and security concerns also explain why users said that while they wanted to communicate through home produced content, they were often reluctant to just send a picture or video out because once you do that you lose control over its distribution:

> You would not want the wrong picture to fall into the wrong hands. I can think of several cases where it would be the end of a friendship if that happened. Because people are always taking photos now with picture phones there have to be ways of making them secure (Amy).

This focus on content will potentially produce large amounts of data and thought must be given to how it can be archived. Furthermore, as the findings from the study indicate, content can have great sentimental value and a lost or stolen phone can also mean the loss of a treasured photo album.

5.6.3 Wrapping the Message in Content (Digital Tokens)

Another example of the way in which users in the study were employing content as a form of social communication was embedding a picture in the bottom of every e-mail instead of a signature. Furthermore, users in the study indicated a desire for this paradigm to be turned around – so that the dominant part of the message is the picture itself embedded with the text message. "What I like about my new (3G) phone is that I can send a picture that I have taken and that's the message. I can add text too if I want" (Matt, 25, unemployed). Essentially, the content becomes the 'wrapper' for the message.

It can be seen how for the participants in the study, digital communication can now be more dynamic, so instead of the traditional voice or text, a message can be a combination of multi media data embedded in a single message or 'token'. However, with this increase in the use of multi media content comes the difficulty in managing all the bits of data.

Five participants reported they are mixing more and more bits of multi media content together in a single message, reminiscent of the way a DJ mixes music samples together into a single track.

Additionally, there is a distinct problem arising in that users are finding it increasingly difficult to manage the bits of data that constitute their digital content collection. “The problem is I can’t find things when I need them. Where did I put that photo, or keep that song, or the last thing that I mixed together.” This indicates that users need a more centralised place to keep their multi media content from which they can gather together the desired elements into a single message or ‘token’.

Moreover, digital content can be quite sentimental and users in the studies report that content stored on 3G phones is particularly vulnerable to loss. Three users reported that their phones crashed resulting in content being lost, while the handsets themselves are vulnerable to loss or theft. This indicates a need for a remote backup archive, and although users can currently back up content from 3G phones on their computer, this content is not easily retrievable remotely via 3G phones.

5.6.4 Content Production across Channels

The studies found that as 3G phones and Internet technologies converge, seven users are merging the two communication channels, for example, taking photos with their phone, downloading them to their computers, editing them on their desktop and then distributing them for free via group e-mail. This is significant because as Counts and Fellheimer (2004) point out, both channels have advantages and disadvantages.

The user studies proved to be helpful in indicating how users are taking advantage of the best of both channels to combine mobile and Internet technologies to create, circulate, distribute and archive content. Users in the studies reported that their ability to share experiences that they have produced themselves via text, images and sound bytes is limited by technical problems such as the incompatibility of handsets. For example, a homemade multi media message produced on a NEC phone cannot be transmitted to a Nokia handset. Users in the studies report that these fears and limitations force them to resort to channels where they can download, for a fee, commercially produced content. This is significant because for the users in the studies, most of the fun of producing their own content was sharing it instantaneously with friends. If users have to wait until they get to their computer to share their content, the moment may be lost. This does not mean that users don’t still consume content rather they resort to downloading commercially produced content instead.

5.7 Conclusion: User Driven Insights

The data from the user study was rich enough so that the third research question could be addressed and multiple user needs were uncovered. These were described in terms of emerging archetypes of users, the spontaneous formation of social networks, connectivity versus control, identity and finally, content production as social communication. Furthermore, the participants' characteristic obsession with their mobile phones resulted in valuable insights into the future design directions of mobile technologies, with respondents providing clear user problems, and, at times solutions.

The findings were placed in to a matrix of emerging themes that provided a snapshot of the data (see appendix 3). However, the emerging themes did not *always* translate into clear and evident user needs and design implications. Therefore, cultural theory was called upon to help reveal more about why users were doing certain things, understand what the meaning of the actions might be and provide a bridge to the third phase of the research which is the translation from emerging themes into user needs and design implications.

PART THREE
TRANSLATION

CHAPTER 6

CULTURAL THEORY: FROM ARMCHAIR CRITIC TO STAR PERFORMER

The first sweep through the data showed that the emerging themes were not about technology; they were about culture, style, fashion, identity, friendship and deceit. Translating such complex and subtle user needs into design called for a philosophical framework to contextualize these nuances of mobile culture. Cultural theory, with its emphasis on the meaning that interactions produce, was ideally aligned to perform this function. Nevertheless, a challenge would be to *synthesize* the complexities of intermingled tropes and competing dialogues that characterize cultural studies discourses into ideas that would be consumable and portable across disciplines within HCI that includes social science, usability, computer science and engineering. This chapter shows how five, basic, abstract cultural theory concepts, (a) de-constructing (user studies), (b) free-floating signifiers (death of the author/designer), (c) looking towards the periphery, (d) conceptualizing digital space and (e) utopian and dystopian outcomes (see Table 1. in chapter 3) were introduced into the user centered design process to translate emerging themes into user needs and design implications (Satchell, 2006).

6 DECONSTRUCTING (USER STUDIES)

Cultural theory inherently treats all phenomena as 'texts' and deconstructs them by looking beyond what is immediately evident in order to uncover the complex meanings that lie beneath the surface. As Derrida stipulates, we must not just look at a specific action at face value, but at the meaning of the action (Derrida, 1985). When used as a lens to analyze the data from the user study, a cultural theory critique perceived the data as a 'text' and consequently de-constructed it to see what meanings were produced. This is important for design as Boehner et al. note (2005), "much attention is now given to design that supports more authentic, rich human experiences taking into account the complex meaning making activities we engage in every day" (p 1).

It is important to note that the claim is not that cultural theory is the superior theoretical framework for analyzing user studies in terms of design; in fact, there are instances where the concepts merely serve to reinforce current methodological approaches such a textual analysis.

Rather, this section will simply describes how a deconstruction approach was used for the analysis of data for this thesis and claim that it proved to be an appropriate choice.

When applied to the analysis of the data from the user study in terms of design, the deconstruction process was beneficial at two levels:

1. Positioning user engagement with technology beyond the moment of interaction and situating it within a cultural context.
2. Uncovering hidden meanings.

6.1.1 Position User Needs in a Cultural Context

Within HCI the need for an understanding of cultural context is now well established. Dourish (2004) argues,

> …the situation in which technology is used has become more variable, and so we need to understand more about it. So, a primary concern in ubiquitous computing research is to understand the potential relationship between computation and the context in which it is embedded (p.20).

He goes on to note the difficulty in achieving this understanding. "'Context' is a slippery notion. Perhaps appropriately, it is a concept that keeps to the periphery, and slips away when one attempts to define it" (Dourish, 2004, p.29). Carroll (2002) too refers to the need to include an understanding of cultural context in the development of design methodologies as an integral part of his distributed cognition theory. He states, "A third tenet of the theory of distributed cognition is that the study of cognition is not separable from the study of culture because agents live in complex cultural environments" (p.78). Furthermore, Suchman (1987) in her seminal text *Plans and Situated Actions: the Problem of Human-Machine Communication* argues for the need to position technological use within a cultural framework.

Cultural theory provides a useful framework within HCI because it provides an understanding of the technology itself *and* the cultural context from where it arose. Cultural theory connects with human activities by examining the underlying concepts that drive behavior, abstracting and inferring symbolism and signification from data. As Lewis (2003) explains, new technologies are not just "the tools or machinery employed by communications media and industry; they are profoundly embedded in culture, its ideology, discourses and meaning-making processes"

(p.380). Using cultural theory in this way to de-construct the data from the user study produced an understanding of user needs in light of a wide range of elements. The result was a rich picture of use that related specific user practices to the conditions where they occurred. As Du Gay, Hall, James, and Negus (1997) stress in their *book Doing Cultural Studies: The Evolution of the Walkman*, new technologies must be thought of in light of the cultures in which they are embedded:

> …to study the Walkman culturally one should at least explore how it is represented, what social identities are associated with it, how it is produced and consumed, and what mechanisms regulate its distribution. (p.17)

Deconstructing the data from the user study to uncover the 'context' that underpins 'activity' highlighted not just what the users were doing, but why they were doing it. For example, twenty-six users revealed that mobile phone ownership goes hand in hand with a need to regularly update others of their actions. In addition, some participants were exchanging text messages so frequently that they were providing a continual update of their day-to-day activities. By looking at what meanings these interactions produced, it became apparent that the continual updating via text messaging was not so much about informing others of their activities. The information conveyed was often of a totally mundane nature. What was being created was a new paradigm of interaction amongst peer networks, where the boundaries of the real and virtual world were blurred, giving way to a sense of constant connectivity.

The analysis presented above helped steer the design of the Swarm phone. As will be discussed for the duration of the thesis The Swarm is a mobile phone that allows users to manage and represent their digital identity.

It could be seen that although there was a trend for users to continually text message each other, this behavior was not about sharing information. Rather, users wanted to occupy the digital space on each other's mobile phone interfaces in order to increase intimacy.

The Swarm provides a way to meet this need by providing a series of avatars that act as digital representations of the user. The avatars, which represent current activity, can either reside on the users' phone or be sent to appear on their friends' phones. As the user's activity changed, the avatar could be updated accordingly, thus allowing a new generation of 'always on' friends to seamlessly maintain a continual presence in each other's lives (see chapter 7).

6.1.2 Users Might be Unaware of Some Meanings

When attempting to sift through the data from the study in search of user needs, the deconstruction process provided a critical lens. Rather than taking 'what the users said' at face value, which can be a downfall of user centered studies (Dourish, 2004) the interview transcripts were treated more like artworks to be de-constructed.

The search was for meaning that might not have been articulated by users because they were related to values so ingrained in everyday life that the participants were no more aware of them than they were aware of each intake of breath. As Boehner et al. (2005) notes, "one must have the methods in hand that let one get at those assumptions, which are often so obvious as to be unquestionable" (p.2). It can be seen that a desired outcome is to develop a process for understanding needs that may not be immediately obvious to the users themselves. As Gaver et al. (1999) noted, "… we didn't want the groups to constrain our designs unduly by focusing on needs or desires they already understood…" (p.22).

The deconstruction process was successful in that it not only revealed what the users said they wanted, but provided insights into the ultimate needs they hoped to fulfil, even if they were never explicitly stated. For example, 26 users reported that they hate their phone; however, the majority of these users also reported that they had great fondness for their mobile. Rather than take this on face value and conclude the contradiction indicated that users have a love/hate relationship with their phone, the data was reconsidered to see what else might be underpinning the finding.

It could be seen that the mobile phone generated space is an extension of personal space and unwanted intrusions were almost as unwelcome as an unwanted intrusion in the home. This meant it was not so much their mobile phones that were disliked by these users, but rather, unwanted callers invading their digital space. Although it was not explicitly stated, the data implied that users want their connectivity tempered by a buffer, or protective zone that mediates the need for real time interaction. This became a key factor of the Swarm phone which was geared to allow users to maintain constant connectivity while providing mechanisms for reducing unwanted contact (see chapter seven).

6.2 Free Floating Signifiers (Death of the Author/Death of the Designer)

A central theme of cultural theory is that individuals will create meaning according to their own experiences which makes embedding prescribed meaning or purpose difficult. This concept was developed by Barthes, who, in his later work, *Image-Music-Text* (1977), examines the process through which signifiers produce multiple representations. For Barthes, this brings about a culture so saturated by multiple meanings that the signifier floats free from the signified and shared understandings are pushed away as interpretation becomes the domain of the individual. The result is the 'death of the author' and the awakening of the 'pleasure of the reader' who seeks to contextualize the text in light of their own experiences.

When applied to design, this has implications for the user/designer relationship. It could be seen that the pleasure users gain from technologies do not necessarily relate to using them in a way intended by the designer, but in using them in often unexpected and original ways that satisfy individual needs. As Bull (2000) notes, "there is no inherent functional fit between design and use" (p.60).

Theorists examining the changing nature of communication models also note this process and draw attention to the erosion of the traditional broadcast model. In the broadcast model the message is sent from the top down and the viewer is the passive receiver. This is known as the 'silver bullet theory' or the 'hypodermic syringe model'. It assumes the consumer of the message will interpret it exactly as the sender intended. However, cultural theory brings about a more complex reading of the process through which messages are consumed in that the message is read through each individual's unique set of experiences (De Fleur and Dennis, 1994). This is especially true as new digital technologies emerge that, unlike the passivity of television, are more interactive, providing users with the opportunity to challenge the one way hierarchy of the broadcast model. The result is users becoming active producers and distributors of their own content.

The application of the 'free-floating signifier' and consequently, the 'death of the author/designer' to the user centered design process was beneficial on two levels:

1. The first benefit is the elevation of 'unexpected use' as a design tool (see also Utopian and Dystopian outcomes at the end if this chapter). The nature of this contribution to user centered design is essentially methodological.

2. The second benefit is a focus on design geared towards the development of new technology that further erodes the boundaries between producer and consumer. The nature of this contribution to user centered design is essentially philosophical.

6.2.1 Unexpected Use as a Design Tool

The death of the author/death of the designer framework, when applied to user centered design, draws attention to the 'pleasure of the user'. This is helpful in focusing on how users are re-contextualizing designs for their own purposes and using technologies in ways that often have very little to do with the original intended purpose. This does not literally mean that the designer becomes redundant; rather, it has methodological implications. It indicates that unexpected use can be an important guideline for what users would like their technology to do in the future.

Unexpected use is not traditionally part of the design cycle, but these instances of unexpected use of technology can be *the* leverage that can elevate user behaviors into design implications. This suggests user led innovation should be of paramount importance in user studies and accordingly, fed straight back into the design loop. This is a paradigm shift, from traditional top down, star-system design. What Rouncefield (2005), calls 'fascist design', which imposes on the user, technologies that fulfill the needs of the designer, rather than the requirements of the user. As Lie and Sorenson (1996), cited in Graham, Cheverst, and Rouncefield (2005) note:

> In fact, one should be careful about the a priori distinction made between use and design, between user and designer. This distinction implicitly inscribes assumptions that the one is passive (user) and the other is active (designer)… (p.8)

With the focus on unexpected use in mind, it was decided that the analysis of the data from the user study would more efficiently fulfill its purpose by focusing on instances when the interaction with technology itself was re-contextualized, re-designed, or re-programmed by users. In this way the users provided clues to not only what could be done better, but also how it could be achieved. This had implications for the methodological structure of the user centered design process.

User centered design is meant to instigate a process through which technologies are developed from the bottom up, in response to user needs uncovered by qualitative/psychological and/or

ethnographic studies (Cooper, 1999; Carroll, 2002; Vrendenburg, Mao, Smith, and Carey, 2002). Yet a criticism that can be leveled at, for example, the approach of Cooper (1999), is that the translation of user studies for design is often characterized by personas that convey user needs without solutions. This means that while technologists are designing with an understanding of users, the possibility of actually incorporating user led innovation is not included. In most instances, this is not problematic because the technology being developed is complex enough that the hierarchy between the user and the technology is quite well defined. The users are not meant to supply the design solutions. However, mobile phones provide accessibility, flexibility, and ease and transparency of use. This erodes that divide. The result is savvy users who are able to exploit the functionality of their mobile phones to meet needs that could never have been envisioned by the designer. To overlook the knowledge that these users could bring to the design process would be a significant oversight.

Examples of unexpected use in the study included employing the mobile phone as a torch, a self defense weapon, a sex toy and, through the use of picture phones – as a mirror for putting on lipstick. The use of the mobile phone as a substitute for a doorbell was another well-cited example of using technology in new and unexpected ways. A user explained, "It's so rude to just turn up at someone's house, buts it's also very convenient, so rather than ring the bell I will stand out the front and ring them from my mobile. Using my mobile phone as a doorbell gives them a chance to pretend they are not home" (Tamara, 25, chef).

The most significant example of unexpected use was that for 33 of the 35 users, the mobile phone was used as more than a communication device; it was used as an icon or status symbol. This was especially notable in that over half the participants reported they spent more time customizing the look and/or sound of their mobile phones to reflect their taste and style than they did using it to communicate.

The revelation that users wanted the look of their phone to represent their identity was fed into the development of the Swarm phone. It was part of the drive behind the development of the Swarm's avatars, which are digital icons that users could customize to represent themselves. The Swarm provides users with an opportunity to not only control how their phone physically looks and sounds, but through the use of avatars that are visible to incoming callers, allows individuals to reflect their identity through a customized, digital representation of themselves (see chapter 7).

6.2.2 Eroding the Boundary Between User and Producer

Boehner et al. (2005) argue successful systems should be judged on facets such as overall engagement, enjoyment of use, integration with everyday experiences and the variability of use or capacity for re-appropriation. This thesis proposes an additional requirement and argues design should embrace a philosophical position that aims to facilitate the process through which new technologies erode the boundary between producer and consumer. Especially in the context of the development of ICT's, users should be able to challenge limits that enforce top down interaction.

Cultural theory brought a philosophical element into the design process that aimed to help the digital generation interact with technology beyond the passive consumption that characterized the previous generation of television viewers. It drew attention to the many instances where users in the study were engaging with their mobile phones to actively produce content. For example, it could be seen 26 participants used their mobile phones to document and circulate their own experiences.

The user study showed users doing this through the use of text and images. However, as 3G capabilities came in towards the end of the interviews, users were becoming increasingly creative - cutting, pasting and mashing together both home-produced and commercial video, sound bytes and texts to broadcast their experiences to their friends. In order to encourage the practice of active content production, the 'Trophy Room' function of the Swarm provides a space where users can archive, mix, display and distribute digital content.

6.3 Focusing on Action in the Periphery

Cultural theory looks beyond mainstream culture and focuses on activities occurring on the 'periphery'. This means that previously un-represented groups and practices come to the fore. Eagleton (2003) in his book *After Theory* argues, "In retrieving what orthodox culture has pushed to the margins, cultural studies has done vital work" (p.13).

One of the 'periphery' groups that have been of most interest to cultural theorists is 'youth'. As Barker (2002) states, "The question of youth cultures has a significant place in cultural studies" (p.320). Furthermore, cultural theory provides a holistic critique of everyday social behaviors of youth cultures, not as some sort of novelty or 'other' but as unique, meaningful cultural formations.

The introduction of cultural theory into the user centered design methodology provided a framework for understanding the unique cultural formations that underpin young peoples' use of technology. This is important because while traditionally, user centered design is concerned with the needs of business and organizational users; studies of use are increasingly extending their focus to a wider range of users and environments (Gaver, 2005; Inkpen, 1997 and Ling, 2001). Furthermore, innovation is often occurring within the subcultures of youth cultures such as hackers and gamers. By understanding the activities of these fringe users, new designs can successfully be brought into the mainstream (Sherry, Mainwaring, Burrell, Beckwith, and Salvador, 2004). The process through which illegal underground peer-to-peer file sharing culminated in the development of the I-Pod is a classic example of this (Silverthorne, 2004).

Cultural theory provides a useful lens for understanding the needs of young people in the user study. It revealed 'youth culture' as a cultural construction as opposed to a biological category (Hebdige, 1979). In doing so, the signifying features, as distinct to those of 'mainstream' society, were revealed:

> Youth is not so much a biological category overlaid with consequences as a complex set of shifting cultural classifications marked by difference and diversity. As a cultural construct, the meaning of youth alters over time and space according to who is being addressed by whom. Youth is a discursive construct. It is formed by the organized and structured ways we talk about and bring into being, youth as a category. Of particular significance are discourses of style, image, difference and identity. (Barker, 2000. p.320)

In this way, a cultural theory critique of the data from the user study directed the analyses of the data to uncover what, if anything, was unique to the subculture of young mobile phone users? What signifying features set them apart from other users?

The focus on the distinguishing features of the young people in the user study revealed a subculture of nomadic users who responded to increasingly fragmented lifestyles by turning the mobile artefact itself into a kind of virtual home base. This enabled them to continually express and maintain their identity, albeit a digital representation of it. Looking at the signifying elements of 'youth culture' itself as a jumping off point for the user study provided insights that shaped the development of the Swarm phone. The Swarm had at its core a virtual lounge room where, through

the use of avatars, users could maintain a virtual presence where they could always be found (see chapter 7).

6.4 Digital Space

When attempting to design new technologies, it is important to have an understanding of the nature of the digital space that users inhabit so their needs can be conceptualized within the contexts in which they are occurring. Cultural theorists provide critical perspectives of digital space through the exploration of (a) the collapse of time and space (Giddens, 1991; Jameson, 1991), (b) the theory of 'hyper-reality' (Baudrillard, 1983 and 1995) and (c) concerns with how digital identity is re-constructed in virtual environments (Haraway, 1991; Turkle, 1995).

6.4.1 'Collapse of Time and Space' and 'Hyper Reality'

One of the most important frameworks that cultural theory can lend a study of users' interactions with technology, is an understanding of how new digital technologies collapse currently held notions of time and space.

Giddens (1991) argues we live in an age where the transformation of place has occurred through the intrusion of distance into local activities. This has an impact on the way we see the world and our place in it. As boundaries of space and time are eroded, we are exposed to an increasingly diverse range of experiences. "Localities are thoroughly penetrated by distanciate influences, whether this be regarded as cause for concern or simply accepted as a routine part of social life" (p.1). Jameson (1991) and Baudrillard (1983 and 1995) see this as a logical extension of capitalistic culture and lament the reduction of culture to a series of digitized images. For Jameson, the compression of time and space means that history has collapsed leaving us in a state of perpetual amnesia. While Baudrillard's (1995) position is reflected in his premise that 'the Gulf War never happened', that its re-creation and global broadcast by CNN became more 'real' than the actual events themselves on the ground. For Baudrillard, CNN's production and distribution of the Gulf War and its consumption by viewers around the globe led to a state of hyper-reality, where an event's re-creation through the media becomes the 'reality' rather than the actual event itself. As shall be discussed shortly, the hyper-real state helps us understand the process through which the account of an activity becomes more important than the event itself. This in turn helps us understand why users in the study were so preoccupied with capturing and sharing experiences via text and picture messages.

The collapse of time and space that digital technologies have ushered in is not universally seen as a negative process. For many theorists it is a means of liberating the user. Wray (1998) interprets the 'rhizome' from the Deleuze and Guatarri text *A Thousand Plateaus* (1967) as a utopic metaphor for cyberspace and sees it representing not only the way in which information flows freely, but the nomadic nature of the journey undertaken by the user. Furthermore, theorists writing specifically about virtual communities also celebrate the way in which digital communities allow users to transcend time and space. For example, Rheingold (2000) a pioneer of digital communities such as The WELL, sees the Internet as a space where users can transcend geographical boundaries to meet like-minded people. For Rheingold the computer mediated collapse of time and space allows the creation of new cultural formations that are just as meaningful as those which happen in the real world.

The concepts of the collapse of time and space, and the theory of hyper-reality, provided highly useful frameworks for understanding the behavior of users in the study. It could be seen that for 26 participants, an experience was not perceived to be authentic unless it was digitally captured, distributed and consumed by others. The reproduction and sharing of the event becomes more important than the event itself. However, this is unlike Baudrillard's dystopian view, where a state of hyper-reality is caused by our seduction by consumer culture. The producing and sharing of images in the user study was marked by its 'grass roots' production values. Users were recording their own multi-media content and either distributing it peer-to-peer via their mobile phones or up-loading it to their computers and distributing it via the Internet.

Does this mean then, that the dystopian aspects of Baudrillard's (1983 and 1995) analysis are not particularly useful in this situation? The answer is that to the contrary, what is highlighted are the design flaws of mobile phones that mean the practice of users creatively producing content is under threat. Users in the study report that their ability to share experiences that they have produced themselves via text, image and sound, is restricted by the limitations such as the incompatibility of handsets. For example, at the time of conducting the study, a homemade multi-media message produced on an NEC handset on the Three Phone Network cannot be transmitted to a Nokia handset on the Telstra Network. This forces users to resort to channels where they can download, for a fee, commercially produced content such as ring-tones and celebrity pictures. Suddenly, Baudrillard's depiction of potentially rich cultural production, being reduced to digitized corporate logos, seems particularly relevant.

6.5 DIGITAL IDENTITY

One of the most important features of digital identity is that like real life identity, it is not singular or static, rather it is mutliplcitious and users can take on many different personas in accordance with the nature of the activity they are conducting or the person they are interacting with (Claube & Kohntopp, 2001). By exploring the pleasure users get from playing and experimenting with digital identity, commonly held notions within computer science are challenged. It is revealed that notions of digital identity should be extended beyond the restriction of information or anonymity (Clarke, 2001).

Cultural theorists such as Haraway (1991), Poster (1995), Rheingold (2000) and Turkle (1995) focus on the re-construction of identity in digital environments. This is important because as Turkle (1995) points out, there is a strong correlation between real life and digital identity. However, she finds that digital identity also breaks free from the constraints of everyday life, allowing users to transcend the limits of the real world. Turkle notes that digital environments allow users to shed the human qualities of age, gender, race, disability and even, as in the case of an HIV positive man who had promiscuous online sex - disease.

The transcendent properties of digital identities are best embodied by the phenomena of MUDS that are networked, online communities. They are similar to massive multi-player games where each player assumes a character; yet, their defining feature is that there is no game play involved. A MUD is not goal oriented and there is no notion of winning or success. Users inhabit them purely for the experience of creating a new digital identity (Curtis, 1992). As MacLeod (1999) notes, “In one MUD a user can be a knight, in another, the user can be a stripper and still in another the same user can be a furry genderless bunny” (p.2).

At a time when designers are theorizing about the nature of user experiences in digital environments and, as Laurel (2003) asks, “Can we create real social depth?” (p.196), it is important to focus on how users want to reconstruct their own identity in these spaces. What qualities do they want to include? What do they want to leave out?

Twenty-seven participants in the user study reported they would rather be represented by an icon or avatar than by a real life representation of themselves. They were more concerned with

conveying a context or activity than they were with realism. This trend was noted by Laurel (2003) who proposes, "It could be argued that creating immersion has become far too involved with high-end graphics at the expense of social narrative and depth" (p.196).

As a response to this, the Swarm maps straight onto the needs of users with avatars that provide a simulated, rather than an actual photographic representation of the person. Furthermore, to facilitate digital identities that are mulitiplicitious and constantly shifting, the current avatar that represents the individual (for example an 'at the beach' avatar) can be changed as the activity changes (for example, to an 'out to dinner' avatar). Twenty-four users in the study reported that interpreting other peoples' digital identities provided a means of identifying what the other person was like. The Swarm aims to enhance this practice by allowing the user to maintain a changing representation of their real life identity (see chapter 7).

6.6 Utopian and Dystopian Outcomes

There is a shared agreement amongst current cultural theorists that 'technology' itself is one of the defining discourses of our time; however, there are widely differing views as to what the implications of this are. When conducting the interviews, analyzing the data and translating the findings into design, the exploration of the abstract utopian and dystopian outcomes provided by cultural theory proved helpful, providing insights into how technological design can either liberate or disenfranchise users.

The utopian view of technology can be seen in the work of Haraway (1991), who, in the "Cyborg Manifesto", paints a post-feminist utopian view of the Internet as a space where a woman is free to create her own identity and lose the shackles of modern constraints by re-constructing her identity free from the constructs of race, gender, and aesthetics. Plant (2001) too, looks at how users are empowered by technology. Rheingold (2000) sees digital communities as a new political utopia - constituted around the sheer pleasures of connections in the free space of the Internet. Poster (1995) also sees technology as enabling users to redefine themselves within a new political paradigm.

On the other hand, is the dystopian perspective, most notably, the nightmarish view of Baudrillard (1995), where Western society is reduced to a series of digitized 'hyper real' images that have little purpose other than to seduce us into the endless consumption of consumer goods

which once purchased, cease to satisfy. The potential dystopian aspects of technology were also noted by Landes (1969) who likens the development of new technologies to the fire Prometheus bestowed on humankind, or the opening of Pandora's Box.

While many cultural theorists are polarized, it is possible to simultaneously view the utopian and dystopian possibilities that new digital technologies present. For this, it is helpful to use the rhizome/arboreal paradigm provided by Deleuze and Guatarri (1987).

In *A Thousand Plateaus*, Deleuze and Guatarri (1967) describe the rhizome as a space where social and cultural liberation is achieved, where the erosion of hierarchy frees individuals, groups and societies from the confinements and rigidity of traditional social and political order. "The rhizome is a centered, non hierarchical, non-signifying system without a General and without an organizing memory or central automation, defined solely by a circulation of states" (Deleuze and Guatarri, 1987, p.21). What is obtained is utopian freedom that results through liberation from the constraints of hierarchal systems.

The concept of utopian freedom of movement supplied by Deleuze and Guatarri (1967) is employed by cyber theorists such as Wray (1998) as a means of explaining how users freely traverse the digital space. While this analysis is in relation to the Internet, it would seem that the concept of the nomadic Internet user extends naturally to explain the urban mobile phone user, who, through the use of their mobile artefact, enters, traverses and leaves social networks without the constraints of time and space. However, an essential part of the Deleuze and Guatarri (1967) model is that utopian elements can only exist in tension with dystopian forces. This reminds us that for every nomadic user who freely traverses smooth mobile phone space, or seamlessly creates and distributes content on the fly, there exists another user struggling with the dystopian aspects of design. This user battles limits such as handsets that provide so little control over the management of incoming calls. The nature of mobile facilitated digital environments changes from a smooth, utopian space to a straighted, dystopian stranglehold.

When analyzing the data from the user study, the exploration of utopian and dystopian outcomes provided by cultural theorists proved helpful in understanding how technological design can either liberate or disenfranchise users. Examples of utopian experiences were tagged as potential leverages for new design, while dystopian outcomes provided invaluable insights into what particular aspects of design could inhibit the user from reaching their desired outcomes.

The dystopian outcomes of mobile phone interaction were especially evident in relation to the production and sharing of content. 3G phones offer users the utopian opportunity to communicate through content they have produced themselves. However, as mentioned previously in this chapter (see unexpected use as a design tool) this practice is restricted by dystopian elements such as fears that the privacy of home produced content cannot be protected, archiving difficulties and finally, limitations resulting from the incompatibility of handsets. This indicates that the challenge for designers is to help users in the creation, protection and management of their own multi-media content so that they can seamlessly distribute across platforms.

The Trophy Room function of the Swarm encapsulates a response to these user problems in a manner that can be utilized by designers. It suggests a series of design implications and demonstrates how dynamic artefacts created and managed on 3G phones will afford users with the ability to broadcast their own personal experiences beyond current technology. This means that users can move past the limits of current technologies that have the potential to render them as passive consumers.

Finally, the use of the utopian/dystopian perspectives revealed that often, it was the experience of using technologies in unexpected ways that proved to be the most rewarding for users. An example of unexpected use to achieve utopian outcomes is the adoption of the mobile phone as a 'virtual lounge room' to provide cohesion in an otherwise fragmented life. Other examples include the practice of continuous text messaging to maintain a virtual presence in each other's lives, thus creating a social network of 'always on friends' using a mobile phone not as a means of communicating, but rather of expressing presence. Additionally, using the on/off/busy status of the phone to communicate activity. On the other hand, rigid design elements that restricted users' ability to deviate even slightly from the intended purpose embodied the dystopian perspective. The dystopian view warns that what may seem like an insignificant frustration with a device, can turn potentially innovative users into powerless consumers.

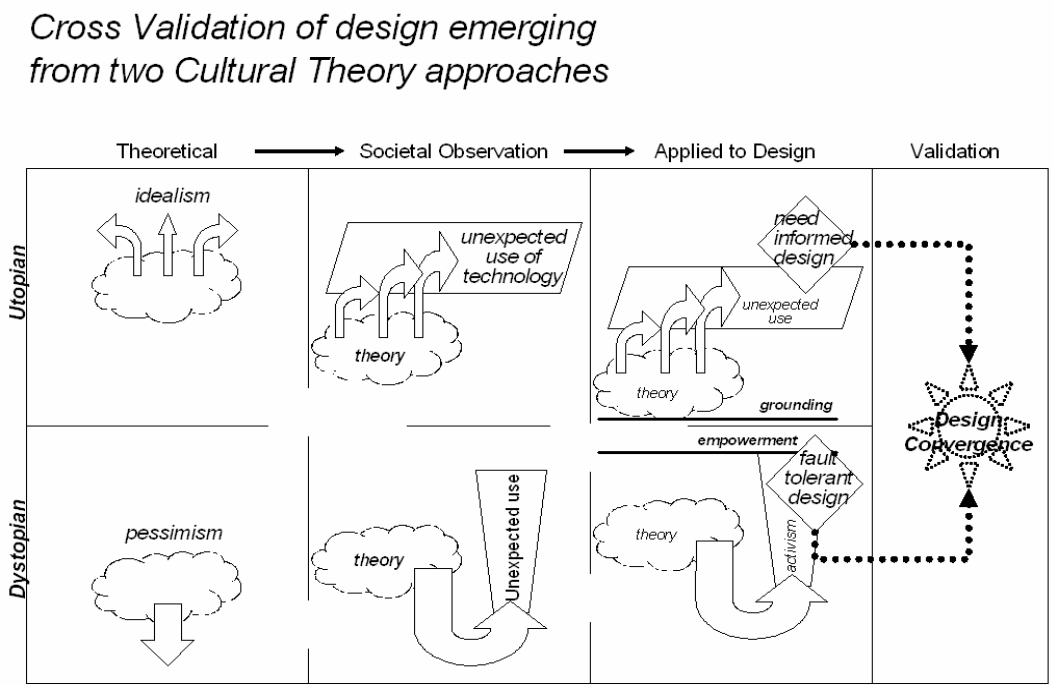


Figure 1. Utopian and Dystopian Outcomes.
Demonstrates the process through which utopian and dystopian outcomes can inform design. It can be seen that unexpected use can prove insights into how users themselves overcome potential dystopian outcomes.

6.7 CONCLUSION: MUTUAL LEVERAGING

The pairing of cultural theory with user centered design puts in place a mutual leveraging that proposes a new process for future technological innovation. This means that not only does the use of cultural theory in this way provide an intellectually rich yet conceptually balanced resource for user centered design; it has implications for the nature of cultural theory itself. At a time when theorists are asking 'what comes after theory' and noting the downward spiral into 'reflexivity' (Eagleton, 2003), cultural theory takes the rich social and cultural commentary of cultural studies and re-contextualises it as a key for successful innovation. This represents a paradigm shift in which cultural theory moves from passive criticisms of what it is observing to active re-contextualing of that on which it is commenting. To paraphrase Dourish, ask not only what theory can do for design, but what design can do for theory (2006).

CHAPTER 7

TRANSLATING USER STUDIES INTO DESIGN

The analysis of the user study provided a successful starting point for getting close to the users' needs. A rich picture of use emerged that positioned the participants' interaction with technology in the context of their day-to-day activities. It could be seen that the young people in the study did have distinct requirements in their everyday lives for which there were, at times, clear technical solutions (Satchell, 2003). This made the translation process from emerging themes to user needs and finally, design implications, relatively seamless. However, it is not enough for the findings to be understood by the researcher conducting the user study, the design implications must be communicated to the technologists within the user centered design team (Singh et al. 2004; Satchell and Singh, 2005). In order to achieve this, techniques from scenario based design were drawn on. This chapter examines the process through which the findings from the user study were transformed into the Swarm.

7 Barriers to Successful Translation from Use to Design

The user study had been conducted and the data was analyzed for emerging themes. The next step was to translate the findings into design. However, even after a successful user study has been completed, the translation from use to design can be problematic. Difficulties in making the creative leap or failure to make the transition can result in rich data failing to make a worthwhile contribution to the design process. (Singh et al., 2005)

Beyer and Holtzblatt (1998) note that studies of use do not necessarily lead to viable design concepts:

> Design is a cognitive activity. It is thought work. It begins with a creative leap from customer data to the implications for design and from implications to ideas for specific features. A clear understanding of the customer doesn't guarantee any kind of useful

> system gets designed and delivered. Design depends on being able to see the implications of data. (p. 16)

In the case of the user study, the application of cultural theory to interpret the data helped address this issue by instigating a degree of theoretical abstraction that allowed the necessary 'creative leap' between user needs and design implications to be made. This was described in chapter 6, in the section 'Deconstruction', where it could be seen that while the initial sweep through the data revealed what users were doing, the additional cultural theory analysis provided insights into why users were doing it and what the implications for future interaction might be. In the same chapter, in the section 'Utopian and Dystopian Outcomes', the recognition of key areas where technology could either liberate or disenfranchise the user provided vital clues to as to what elements to bring into, leave out, or repair in the process of developing a new design.

Another drawback to the successful translation of user studies into design was noted by Button (2003). Button argues that the translation from use to design is inhibited when the user study is conducted by social scientists while the design concepts are in the hands of the technologists. Button makes an important point.

As was discussed in chapter 6 in the section 'Free-floating Signifiers', it was decided the analysis of the data from the young peoples' study could more efficiently fulfill its purpose by focusing on instances when the interaction with technology itself was re-contextualized, re-designed or re- programmed by users. In this way the users provided clues to not only what could be done better, but also how it could be achieved. Incorporating the users as 'designers' in this way reduced the leap that, as Button (2003) pointed out, often has to be made between what the users would like to do and how computer scientists and engineers implement the solutions. In this case, this approach contributed to the translation of use into design that was virtually seamless. Once a clear understanding of the design implications were in place, scenario based design was drawn upon to embody the findings.

7.1 SCENARIO BASED DESIGN

Translating the emerging themes from the user study into design implications is only the first step of the process. It is not enough that the results be understood by the researcher conducting and

analyzing the user study, these discoveries, in all their nuances and subtleties, must be communicated to the rest of the design team.

In order to keep within the parameters of the scenario based design approaches, the emerging themes, user needs and design implications from the user study were embodied through a persona and a scenario.

The scenario, called The Swarm (see chapter 9 for the full Swarm scenario) was in keeping with the approach of Cooper (1999) in that it used a persona – 'the Nomad', to convey the unique characteristics of the user group. As well, the method of Carroll (1997) of using a narrative to tell the story of the users' needs through a depiction of possible future interaction was employed. However, the Swarm scenario extended the concept of future interaction by telling the story of the archetypal user engaging with an imagined 'ideal' technology to achieve their social and cultural goals more effectively than current technologies allow. In this way the scenario was a 'Scenario-Prototype' because it was a design solution specific. This sets it apart from the scenarios outlined by Cooper (1999) where the link between the user problem and the design solution is not made clear and is more in line with the recent work of Carroll (2002) where the basis for design is incorporated within the scenario.

7.2 User Problem – Design Solution

This section makes transparent the process through which 'emerging themes' were translated into 'user needs' and 'potential design solutions' that were then embodied by the Swarm and the Trophy Room.

The Swarm is a design for a mobile phone that ideally, should enable users to enhance their social and cultural goals that were identified in the user study. It emerges from the persona of the 'nomad', a user whose lifestyle is characterized by the spontaneous formation of social networks. The Swarm meets the needs of the nomad by providing a 'virtual home base' where, through the use of avatars, users can maintain a continual digital presence. This supports the spontaneous formation of virtual social worlds while providing assistance in controlling the boundaries of these virtual spaces. The use of avatars also allows for the expression of different identities in a variety of contexts. Finally, the Trophy Room, an additional function of the Swarm, provides users with the opportunity for more sophisticated content production, display and distribution, suggesting a series

of design implications and demonstrating how dynamic artefacts are created and managed on 3G phones. This affords users with the ability to broadcast their own personal experiences beyond current technology.

7.2.1 Emerging Theme: The User Archetype: The Nomad

User Problem: Young people are living increasingly fragmented lives; however, it has been shown that mobile phones can provide cohesion by providing the one place where the user can consistently be found. How can a future mobile phone do this more efficiently?

Design Solution: The Swarm is a virtual lounge room that resides on a mobile device. It is always on. The user is represented in their virtual lounge room by an avatar. The avatar represents the user as being engaged in a specific activity. This allows the user to maintain a constant virtual presence. The Swarm provides the user with a virtual home base on their mobile phone so no matter where they may be physically they are still in one place digitally.

7.2.2 Emerging Theme: Tension Between the Desire for Fluidity and the Need for Control

User Problem: Users want connectivity at all times; however, this does not mean they want to be contactable at all times. A mechanism needs to be put into place that allows users to have control and fluidity over the virtual space that the mobile phone creates.

Design Solution: The Swarm provides a virtual lounge room that is the first point of contact for visitors to the phone. An avatar of the user meets visitors. Visitors to the phone can see what the person is doing without having to talk to the person. Note that the ability to not be contacted is as important as the ability to be contacted. This level of control over virtual space is at the center of the Swarm.

7.2.3 Emerging Theme: Users Want to be able to Communicate a Message without Interacting

User Problem: Both sender and receiver of calls would like to have the option of conveying a message without having to actually speak to each other.

Design Solution: The first thing the visitor to the phone sees is an avatar that represents the user as being engaged in a specific activity. This means the owner of the phone can convey

something to a visitor without having to talk to them. Avatars are not taken literally but rather allow for an iconic representation of what the user is doing at the time. For example, an avatar of the owner of the phone wearing a suit and holding a briefcase indicates that they are in a meeting, while an avatar of the owner wearing a cocktail dress holding a martini glass indicates that one is 'out on the town'. The Swarm comes with an initial selection of avatars and more can be downloaded from the Internet. In order to provide further clarification, voice tags can be attached to the avatars. The Swarm can also provide people with a temporal framework as well in that a 'watching a movie' avatar would indicate the person is only busy for a few hours, where as a 'skiing' avatar would indicate the user will be gone for a greater length of time.

7.2.4 Emerging Theme: Mobile Phones are Central to Identity

User Problem: This is significant from a user needs perspective because it indicates that creating a digital identity is not only about how much information can be restricted but rather what is revealed. The challenge for designers is to create a mobile artefact that allows the user greater freedom to use their mobile phone to express their digital identity. Therefore, a mobile phone needs to be robust enough to allow the user to construct different identities in a range of contexts.

Design Solution: The Swarm's virtual lounge room supports multiple avatars that represent the users' multiple identities. The users can set up the avatars so that they can simultaneously convey different meanings to different people. For example, one avatar conveys professional identity and the other a social identity.

7.2.5 Emerging Theme: Producing and Distributing Content is Integral to Sharing Experiences

User Problem: How can a mobile phone meet users' needs for more sophisticated facilities to share their experiences through the production, distribution and display of content? It is also important for the content to be protected and successfully archived because it can have great sentimental value.

Design Solution: The Swarm, which has picture and video capabilities, allows the owner of the phone to capture and display 'up to the minute pictures' on the 'walls' of their virtual lounge rooms. By doing so the owner of the phone is able to customize the look of the room and make it reflect a continual digital representation of their real life. This can act as an incentive for those not

present to join them or allows for those who cannot be there to 'get the picture'. There is also a need for a remote archive that can store massive amounts of data and provide an appropriately safe place for backing up precious content.

7.2.6 Emerging Theme: Privacy is a Concern in Relation to Protecting Content

User Problem: The study indicates the importance of protecting who can access, add to, or edit their content. What effective but realistic mechanisms can be put in place to ensure that the user can control visitors' access?

Design Solution: Ideally, the intelligent agent that operates within The Swarm to process visitors and manage the avatars will be able to authenticate visitors to the phone and then admit them accordingly.

7.2.7 Emerging Theme: Controlling Content

User Need: Capturing, creating and distributing content, such as digital pictures, plays a big part in constructing digital identity, and this means that young people want to be able to express themselves via a set of *negotiated* rules as to what parts of their constructed identity and information others may be able to see.

Design Solution: The Trophy Room offers an additional room to the Swarm's virtual lounge room which acts as an 'art gallery' feature for content, so visitors can come and browse selected images/sounds/text without being able to copy and re-distribute them. The scenario, called the 'Trophy Room' essentially embodies the user needs from the studies by providing a digital art gallery where users can archive and display their multi media content. It resides on the user's mobile phone, although the Trophy Room can be accessed via the Internet. This solves the first user need that while users are happy to share their content, it is more desirable if they can maintain it in their own space where visitors can come and listen or look.

7.2.8 Emerging Theme: Wrapping the Message in Content (Digital Tokens)

User Need: Users reported that they are mixing more and more bits of multi media content together in a single message, reminiscent of the way a DJ mixes music samples together into a

single track. However, there is a distinct problem arising in that users are finding it increasingly difficult to manage the bits of data that constitute their digital content collection. This indicates a need for a remote backup archive, and although users can currently back up content from 3G phones on their computer, this content is not easily retrievable remotely via 3G phones.

Design Solution: The Trophy Room provides a place to archive and display images which makes it a logical site for content distribution. This addresses the second user need for better management of multi media content. Users can then 'cut and paste' the desired bits of content into a central token which can then be SMS/MMS or e-mailed to selected friends. Furthermore, users would be able to have a choice over what the tokens looked like. For example, the token could be a text message embedded with pictures, or a picture embedded with sound bytes.

7.2.9 Emerging Theme: Content Production across Channels

User Need: Users in the studies reported that their ability to share experiences that they have produced themselves via text, images and sound bytes is limited by technical problems such as the incompatibility of handsets. This is significant because for the users in the studies, most of the fun of producing their own content was sharing it instantaneously with friends. If users have to wait until they get to their computer to share their content the moment may be lost. This does not mean that users don't still consume content. Rather, they resort to downloading commercially produced content instead.

Design Solution: For multi media content sharing as social communication to be successful content has to be seamlessly distributed across platforms so that experiences can be shared instantaneously. Ways in which content could be carried across platforms included the use of MPEG21 and the use of instant messaging and peer-to-peer systems such as Jabber and JXTA.

7.3 Conclusion: Scenario Prototypes

The past two chapters have addressed the final research question by making transparent the process through which the findings from the study were translated from 'emerging themes', into 'user needs' and 'potential design solutions'. It has described how once the needs were understood, scenario based design techniques were employed resulting in the user requirements being embodied by a scenario called the Swarm.

Essentially, the Swarm (see chapter 9) provided a narrative that envisioned an 'ideal design' and this distinguished it from traditional scenarios that are not as design solution specific. In the process of doing this an additional contribution to knowledge has been made which is the development of the 'scenario prototype' as a design tool, hence the term 'Scenario-Prototype' has been coined.

As will be discussed in the following two chapters, the next step was to critically reflect upon the development process of the Swarm Scenario-Prototype, test it with users and workshop it with the technologists and industry partners in the SITCRC.

CHAPTER 8

USING SCENARIOS AS CULTURAL PROBES

The Swarm Scenario-Prototype was presented to the technical members of the SITCRC User Centered Design Team at one of the regular workshop sessions. It was met with approval by the computer scientists in the group because it provided a snapshot of the unique social and cultural practices of the user group, a clear understanding of the users' needs and specific design implications. Significantly, the design implications embodied by the Swarm, presented technical challenges that computer scientists in other programs in the SITCRC including Smart Networks, Intelligent Environments and Smart Personal Agents could go about solving.

The Swarm was relevant for the computer scientists within the Smart Networks Project who would need to develop a peer-to-peer network that allowed the avatars to communicate with each other. The Swarm provided the Intelligent Environment group with the opportunity to embed context aware and ubiquitous technologies into a mobile device so that the avatars could represent users' activities and locations by interacting with radio frequency tags (RF) in built environments. Finally, the Swarm presented a challenge for the Smart Personal Agent computer scientists, as they would need to develop rules that would allow the avatars to be set up in order to communicate the correct information to the relevant incoming caller.

A number of scenarios were presented during consequent workshops with the SITCRC User Centered Design Team and other stakeholders within the Smart Internet Technology CRC; however, the Swarm was selected as the scenario that would form the basis of a physical design. As will be discussed in the rest of this chapter, before the Swarm was built, it was decided to test it for rigor by returning it to selected users from the study.

8 TESTING THE SWARM FOR RIGOR

The study of young peoples' use of mobile phones conducted for the thesis required a focus on everyday activities in social settings. The open-ended interviews had been effective for gathering user requirements and the analytical approach of grounded theory building within the theoretical

framework of cultural theory had situated the user needs within a rich cultural context. However, as was discussed in chapter 3, current design theory suggests the examination of users in non-traditional settings requires new methodological approaches that may be more appropriate for understanding use in more complex situations.

The chance to further engage with participants was beneficial. Lingering concerns about the open-ended interview method used for the initial gathering of user requirements remained. This was not because the use of one-on-one and group interviews was ineffective. To the contrary, as discussed in previous chapters the user study was successful with most participants providing insightful responses. In addition, the process of analyzing the data using grounded theory within a theoretical framework of cultural theory had made the translation from user needs to design relatively seamless. Nevertheless, the use of this approach for gathering user requirements went against advances in state of the art design philosophy that called for new and innovative ways for conducting user studies in sensitive settings (Gaver et al., 1999). Therefore, despite the success of the user study, a question lingered: Was the open-ended user study the most effective method of conducting research into the needs of young people in social situations? In this way, the chance to return the Swarm to selected users in the study represented more than an opportunity to test the scenario for rigor; it represented the opportunity to try another method for gathering user requirements in a social setting.

Inspired by Gaver et al. (1999) who used cultural probes to uncover the needs of elderly users in special care settings, it was decided to use the scenario itself as a form of cultural probe to further uncover young peoples' needs in social environments. It was hoped that the narrative conveyed through the Swarm would provide users with a new way of reflecting upon their own practices of use. They could, for example, recognize and confirm their own behavior, distance themselves from what was portrayed, or re-write the scenario in new and unexpected ways. Moreover, the use of the scenario as a cultural probe could augment the open-ended interviews by testing the validity of the initial findings from the interviews, fill in any gaps in the research and, perhaps, generate new insights.

This led to two more studies being conducted. The first was the Swarm Evaluation Study in which seven 'ideal' users were selected from the original study to provide an evaluation of the Swarm from a user perspective. The second was the Business Perspective Study which was driven by the commercial needs of the SITCRC and industry stakeholders. It was conducted to find out

more about the Swarm in regards to cost and representation. Twenty-six users, including 11 from the original study participated.

From the perspective of the research being conducted for the thesis, the benefits of these additional studies were (a) the introduction of a new approach to gathering user requirements that could provide insights that may not have been revealed through the in-depth interview process, (b) ensuring the rigor of the scenario and (c) involving the user in the very early stage of the developmental process; a bit like participatory design (Berg, 1998; Bødker, 1985; Ehn, 1989 and Grenbaum, 1991), but without an actual working prototype.

8.1 SWARM EVALUATION STUDY

Seven participants from the initial user study were selected to receive the Swarm cultural probe kits. They were the most savvy and enthusiastic of the 35 participants in the study. This meant that they were not representative of the average person, rather they represented 'the ideal user' - familiar with all the functionalities of their mobile phones and aware of what they would like new mobile technology to do in the future. Rather than being problematic, it was thought that the use of 'ideal users', with distinct opinions and ideas would be helpful in effectively incorporating the needs of users into the design process. These were users who could make a real contribution and this was embraced (see chapters 3 & 4).

The Swarm cultural probe kit, which simply consisted of the Swarm scenario printed on a piece of paper (see chapter 9 for the scenario) was left with the participants who were instructed to comment on, or even re-write the scenario. The backs of the pages were left blank for their comments. Ling (2002) notes that without the pressure of the interview situation, users are able to reflect more freely upon their own practices; therefore, rather than oversee the process through which the participants considered their responses, the scenarios were picked up a few days later and when possible, a brief discussion in relation to the participants' comments took place.

The use of scenarios as cultural probes was to be one of the most interesting parts of the research into young peoples' use of new digital technologies. The Swarm produced a high level of user feedback, providing not only a means for the users to reflect further upon their own use, but also the opportunity for them to suggest potential additions to the scenario. Five of the seven ideal users provided detailed analyses of how or why the proposed scenario would or would not benefit

them and three made extensive changes. In this case, the use of a scenario proved helpful in filling in the gaps in the user requirements left by the open-ended interviews. The use of both methods combined provided an in-depth understanding of the participants' use. As Wixon (1995) points out in relation to user centered design, "when different methodological approaches point to similar conclusion, there can be increased confidence in the findings" (p.163).

8.1.1 SESSION ONE

The data from the first launching of the Swarm cultural probe kit was analyzed. The 'ideal users' provided valuable insights into how the scenario's design could be improved. The need for two main changes was evident:

1. The need for the simultaneous formation of multiple identities.
2. The need for control over access to digital content.

The Need for the Simultaneous Formation of Multiple Identities

The Swarm phone was designed to provide users with the means to convey their current activity through the use of avatars. However, three of the seven ideal users rewrote this function so the avatars were not conveying what they were really doing, but rather, what they wanted others to think they were doing. As one participant in the user study noted:

> I like this idea of using an avatar, I like it a lot, but, oh my God, I just realised that you could never just use the same one for every caller. That's what's wrong with this design. (Bart, 28, sign writer)

It could be seen that the need for avatars to convey 'what I am doing now' was really a need to convey 'what I want others to *think* I am doing now'. The users wanted their friends to see that they 'were at the beach'; while their boss would see that they were 'sick in bed'. Essentially, users wanted to use their mobile phone to facilitate lying. This was noted at the *Ubiquitous Computing Conference* in Nottingham when this work was being presented:

> Essentially this Swarm device goes against what we are trying to achieve at Ubicomp – it doesn't reveal the real location of the person or the context of their activity. Essentially all it does is facilitate lying – I love it. (Comment during presentation of the Swarm at The Ubiquitous Computing Conference. Nottingham, October, 2004).

The modified scenario was taken back to the technologists. The ensuing discussions revolved around how the new developments would fit with the technical directions of the SITCRC. The concept that users might not want the technology to represent their actual location and activity introduced a new paradigm. Ubiquitous computing, such as location and context aware systems had initially been seen as the answer to the user need to convey presence. However, it now appeared that a new technical solution would have to be found. Users did not want to use the technology to reveal their real location and activity; instead they wanted the freedom to simultaneously express multiple identities to different people.

From a technical perspective, this was problematic because ubiquitous computing does not facilitate lying; however, it appeared that this was a need that had to be met. This increased the challenge for computer scientists within the Smart Personal Agent Project who would no longer simply make sure the correct avatar represented the user's current activity, but rather, that each avatar represented different things to different callers in light of preferences the users had set up for themselves.

Control over Access to Digital Content

The second need to emerge was that users would not just want visitors to the Trophy Room to access all the content that was there, for example, there would be different groups of people with whom they would want to share different photos. Six out of seven ideal users stated that the idea of just providing free access for all would be highly undesirable because photos were often specific to events and only people that were at the events should have access to the photos.

The Trophy Room scenario was re-contextualised by the ideal users as a space where 'selected' others would have access to it, or parts of it, and amongst these "selected others" different visitors would be granted different levels of access. For example, only a best friend would be allowed to see the picture of the blind date the night before, but a video of a swimming race win could be accessible to any visitor.

Work-shopping the ideal users' responses for the need for more control over content on the Trophy Room function indicated that ideally, the picture gallery function would take on a different look depending on who had access to it. For this to be achieved a technical solution that allowed easily controlled peer-to-peer authentication had to be introduced so each visitor could be assigned their own set of rules.

8.1.2 SESSION TWO

The modified scenarios were once again returned to the ideal users. One of these users had gone overseas so the sample group was reduced to six participants. Once again the feedback provided by the scenario cultural probe kit would generate new insights and the need for two more important changes was revealed:

1. The need for a default mode.
2. The need for a 'sunset clause' over access to personal content.

The Need for a Default Mode

All six ideal users confirmed allowing users to represent different avatars to different callers was a highly desirable feature. However, there were now more problems that arose. The users' initial desire was to be able to control who called them and when. This led to the development of avatars so that a digital representation could be programmed to act for the user. Yet, when revisiting the modified scenario, four users stated that while this level of control was a desirable feature, it should be just that – a feature. There were times when you wanted a lot of control over who called you and when, but at other times you didn't want to have that level of involvement with the phone. Three users expressed the need for a default mode that would just reveal 'at work' during weekdays and 'leisure mode' on weekends.

In the next SITCRC workshop it was recognized that in accordance with this user need the Swarm would have to be modified again with the addition of a default mode that indicates the user as either at work, university, school, home or in leisure mode. Furthermore, in order to better meet the user need of not always having to tell the phone what to do, the avatars could be programmed to act in accordance with the nature of the activity they are representing. For example, a 'watching a movie avatar' would expire after two or three hours and revert back to a default mode so the user doesn't have to remember to de-activate it. Additionally, in keeping with the context of the activity, the 'at the movies' avatar would make sure that no sound was emitted from the phone while it was activated so the user would not have to remember to turn their phone down before entering the cinema.

'Sunset Clause' over Access to Personal Content

All six ideal users agreed that the extra level of control over who saw what was an important addition to the Trophy Room function and that part of the pleasure of having content on display was deciding who got to see what. However, three users indicated that a desirable feature would be if selected visitors could also contribute their own content, so that, if for example, a group of friends went to an event, visitors at that event could add their own photos as well. The second participant to finish their analysis of this round of evaluations noted that it was problematic that once a visitor was allowed to enter the Trophy Room they could, over time, continue to do so. This was brought up with the four other participants when picking up their re-worked scenarios and they all agreed that this was a valid point. There were times when it would be most undesirable for a visitor to have access six months down the track just because they had been admitted to the Trophy Room to see one group of photos.

The user need for a 'sunset clause' over access to content was discussed at the next SITCRC workshop meeting. A table was developed to map out how visitors would be provided with different levels of access (see table 2). This could be done by setting up profiles so that when they try to enter the Trophy Room the profile group that the owner of the phone has set up for the visitor automatically grants them a level of access. The idea of a 'day pass' was included so someone could see a particular picture from an event once, but then not return unless invited. The table illustrates the levels of access users want to apply to their digital content.

Access Profile	*Areas Accessed*	*Potential Visitor*	*Content Allowed*	*Duration*
Gold Pass	Access All Areas	Best friend, partner.	Visitors can view all content and also contribute their own images, text and sounds.	Unlimited
VIP	High Level Access	Friends, close relatives, trusted work friends.	Same as a Gold Pass but a VIP visitor would not have access to every single part of the trophy room.	Unlimited
General Admission	Access to the 'sanitized' part of the Trophy Room.	Parents, colleagues at work.	The general admission lets visitors into a controlled part of the trophy room. Visitors cannot post their own content.	Unlimited
Day Pass	Same as General Admission.	Visitors that may want to see specific content.	Same as general admission.	Expires after 24 hours

Table 2. The Trophy Room Access Levels. Demonstrates degrees of content access.

8.2 Business Perspectives Study

Once the modifications from the cultural probe testing had been implemented the Swarm Scenario Prototype was presented to the SITCRC industry stakeholders. They saw two potential business benefits in the Swarm. The first was through users paying to see each others' virtual presence status. The second was through users downloading avatars from the Internet to represent their digital presence in a similar way to the current practice of downloading ring tones. Initiated by the SITCRC, a user study of 26 participants was conducted in order to find out more about user attitudes to 'cost' and 'representation'.

Due to the SITCRC's need for rapid response, this phase of the research was a quick and informal process, designed to provide what Hughes, Kyng, Rodden, and Andersen (1994) call a 'quick and dirty snapshot of user needs'. Only 11 of the participants from the original study took part and the other 15 participants were selected mainly through convenience (social encounters, friends and colleagues) rather than demographics. To boost participant numbers, the age limit was extended to 32 years of age. As with the original user study, the majority of the participants were technically savvy. This was not by design and further supports the findings from the literature review and initial user study which is that young people in general are 'expert users' of mobile phones.

The structure of this study was similar to the cultural probe study in that a printed version of the Swarm Scenario Prototype was presented to the participants. However, in this case the users were interviewed immediately upon reading the scenario for their response. The interviews were not tape-recorded; however, field notes were taken and when a particularly resonant user quote was provided, it was faithfully recorded.

8.2.1 Uncovering Attitudes to Cost and Representation

Upon reading the Swarm Scenario-Prototype, 23 of the 26 participants said they would use a function that displayed their own and revealed their friends' virtual presence. Of the three users who would not use the function, one reported that he couldn't envision buying a phone that would be likely to carry such an advanced feature. Another user was ideologically opposed to the concept of

creating a digital identity from an Orwellian, 'big brother is watching' principle. The final participant 'couldn't be bothered'.

The 23 users who stated they would use this function were asked about costing:

- Twelve users said they would pay between 10 cents and 20 cents.
- Four users said they would pay about 50 cents.
- Five users said they would pay up to $1, but for all of these 10 users, this meant they would use the function less often.
- Two users said no more than 10 cents.

The 23 users who stated they would use this function were asked about frequency of use:

- Five users said that especially on the weekends, they would check what their friends were doing up to ten times a day.
- Ten users said that they had two or three friends that they would check on daily.
- Eight users said they would only use this option occasionally.

It was established that ideally, the charge to check the virtual presence status should be no more than the cost of sending a text message with twenty-two users noting that frequency of use would be linked to cost.

Eighteen of the 26 users said they would be willing to pay to down load an avatar:

- One user said they would pay about 10 cents.
- Five users said they would pay about 20 cents.
- Four users said they would pay about 50 cents.
- Eight users said they would pay about $1.

Additionally, two of the above users said they would be willing to pay up to $100 for a limited edition avatar.[3] As one user noted;

[3] The method of payment was not discussed.

> This is the fun part, deciding how I'm going to be seen when people visit my phone. Do I get to choose what I'm wearing? I would want hundreds of avatars. I want couture avatars of course. I would pay for limited edition ones too. Can I just download them from the Internet like ring tones? (Indigo, 24, events manager)

It could be seen that while ideally, avatar downloads from the Internet should be in line with the cost of down loading ring tones, some users were willing to spend a lot of money on constructing their digital identity.

In addition to uncovering user attitudes towards cost, participants in the study were questioned about what qualities they might want from their Swarm avatars in terms of representation. It was revealed that there are two distinct, although not mutually exclusive, schools of thought on this matter.

The first group represented 17 of the 26 users. They had a desire for pop culture and designer avatars and would like their digital representation to be tied in with current culture. For example, one user noted that with the release of the third *Star Wars* prequel he would choose a series of avatars that represented him as being engaged in different activities looking like Darth Vader (Scott, 18, hairdressing apprentice). This group also includes 14 users who would want to dress their avatars with designer clothes labels.

The second group consisted of 12 users (three of whom were also represented by the previous group) who would like to be able to create their own avatars. They desired a more creative and less mass produced and commercial approach to virtual presence. These users were questioned in regards to how they would like to construct their avatars. Six users suggested this could be achieved using a similar technique to the creation of avatars from computer games such as *The Sims*. Two users put forward the idea of a digital 'paper dolls' approach.

8.3 Conclusion: The Swarm as a 'Boundary Object'

The goals of the Smart Internet Technology CRC had influenced the study of young peoples' use of new digital technologies in terms of design from the very start of the research. Regular meetings and e-mail exchanges had helped provide effective and sustained communication between

members of the user centered design team. This is important because as Brown (1997) points out, "Communication is often the most important challenge in a multi-disciplinary project. 'Seeing differently' and being comfortable with a plurality of stories and languages requires sustained work" (p.68).

Although there was mutual understanding and respect for the parameters of each others' disciplines, there were many moments during the regular workshop meetings when finding cohesion and shared understandings amongst the multitude of perspectives was challenging. It was interesting to note then, that the Swarm's arrival helped overcome some of the disjuncture. The process of testing the Swarm with users, analyzing the results, recontextualsing the design, and repeating the process, enhanced the interaction between members of the user centered design team. Essentially, the Swarm had become what Star and Griesemer (1989) would call a 'boundary object' which is an artefact that allows different parties to relate to the object through their own contexts:

> Boundary objects are an entity shared by several different communities but viewed or used differently by each of them. As Star points out, boundary objects in an organization work because they necessarily contain sufficient detail to be understandable by both parties, however, neither party is required to understand the full context of use by the other - boundary objects serve as point of mediation and negotiation around intent (Grey, 2003, p.1).

The Swarm generated new discussions and acted as an 'interface' between different perspectives, generating discussion within the user centered design group and other groups of technologists within the SITCRC. This became a two way process where the Swarm helped provide the technologists with specific user requirements, while the technologists saw possibilities for additional design possibilities. As will be discussed in the next chapter this led to multiple iterations of the Swarm.

CHAPTER 9

THE SWARM AND SWARM SPECIES

In an organization like the SITCRC that was intensively multi-disciplinary, the Swarm Scenario-Prototype had become a boundary object, "both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer, 1989, p.393). This led to multiple iterations of the Swarm, each version embracing a different aspect of functionality. The first version presented in this chapter is the original Swarm Scenario-Prototype, slightly modified after a series of user input and testing. This is the version of the Swarm that has been provisionally patented as an International Innovation Patent. Although the goal of this thesis is not to map the development of each of the physical prototypes or evaluate their effectiveness, in order to finish the story of the research, the rest of the chapter describes the 'Swarm species' - the other prototypes, Scenario-Prototypes and collaborations that emerged from the initial study into what young people, living in Australia, aged 18-30, want technologists to do to make their life better.

9 THE SWARM SCENARIO-PROTOTYPE

The Swarm Scenario-Prototype provides a narrative that tells the story of use which provides a meta-description of the way the depicted technology operates. *Italics* are used to indicate the artefact's social and cultural purpose. This is done so those building the device can make sure the physical prototype stays true to the original scenario. It was found that the use of this technique helps to prevent 'conceptual drift'[4] and contributed to a common understanding within the design group.

Persona

Jade is 23 years old. She lives with her parents, goes to university and has a part-time job in a pharmacy. She has a boyfriend, a best friend, Sarah, as well as numerous groups of friends;

[4] Thanks to my colleague Michael Coburn for coining this term during a workshop meeting September, 2003.

university friends, old school friends and people she met through playing sport. She has a bunch of close and not so close relatives, some of whom she also sees on a social basis. She enjoys playing netball, shopping, and going to up-market bars and restaurants.

Scenario

Jade is always on the move. She stays at her boyfriend's once or twice a week and at her best friend Sarah's apartment in the city after they go out which is at least once a week. Often, she has late lectures in which case she stays with one of her university friends.

Jade is not a planner. With the exception of university lectures and her Saturday job at the pharmacy, her life is very much unstructured. Furthermore, Jade's friends are not planners either. They go about their lives in ways that may seem to previous generations to be totally unconnected to each other. They have no central meeting place where they hang out – like the mall, or the main street or the family house. They rarely plan ahead to meet; rather, through the use of mobile phones, arrangements are made on a minute-by-minute basis.

Because of her mobile technology Jade is able to move between groups of people and activities with ease and fluidity.

It's 4pm on a Friday afternoon. Jade has finished her last lecture for the day. She gets on the tram at Melbourne University and heads into the city. She gets her mobile device out of her bag and logs into her virtual lounge room.

Her lounge room is a 'virtual home' that resides in the owner's mobile phone. It is always on. It serves as the first point of contact for anyone getting in touch with the owner of the phone.

The first thing Jade sees is that a note has been left by her best friend Sarah who must have visited the virtual lounge room while Jade was in a lecture. Sarah would have been met by an avatar of Jade sitting in a lecture theatre. Jade clicks on the note and an avatar of Sarah in a business suit pops ups. Just by looking at the avatar Jade is able to determine that Sarah must still be at work. However, the avatar is also embedded with a specific message for Jade which advises her that Sarah is finishing work early and wants to catch up with Jade in the city. Jade, who is about to get off the tram at Collins St., clicks on her avatar menu and selects one that depicts her carrying boutique

shopping bags. She attaches a voice tag, “In Collins St, meet you here as soon as you can get away from work.”

She instructs her ‘shopping’ avatar to notify Sarah of her activity and the avatar of Jade with boutique shopping bags appears in Sarah’s virtual lounge room. Meanwhile, not wanting to be disturbed by anyone else while she is shopping, nor alert her boyfriend and parents to the fact that she is out spending money, she decides to leave her ‘in a lecture avatar’ activated for everyone else but Sarah. She instructs her mobile device to screen all calls according to the avatar profiles she has set up, puts the mobile device back in her bag, gets off the tram and heads for the stores.

The virtual lounge room supports multiple avatars that represent the user’s multiple identities. They do not have to represent what the user is doing, but rather, what the user wants others to think they are doing.

Twenty minutes later she is in a shoe shop and her phone rings. She knows that unless it is an emergency, in which case avatar profiles can be overridden, it must be Sarah as every other visitor would be subjected to the ‘in a lecture’ scenario and know not to call. Sarah is two minutes away and they meet up and spend a happy, uninterrupted hour shopping. Sarah, who has left work early, has left her avatar on ‘in a meeting mode’ so she is not disturbed by calls either.

Note that the ability to not be contacted is as important as the ability to be contacted. This level of control over virtual space is at the center of this technology.

At six-o-clock, the two friends go to an up-market bar for a drink. Both girls take their mobile devices out of their bags and log into their respective virtual lounge rooms. Jade sees that while she has been shopping or rather ‘in a lecture’ three friends have visited her. The have all left notes which she clicks on and their avatars appear. The friends are happy that it is Friday and want to catch up. She quickly goes to her avatar menu and selects one of her with a martini glass. She makes this her universal avatar so that everyone that comes to her virtual lounge will see this scenario.

The label ‘avatar’ is a term that is embedded in gaming culture and one that pops up frequently in popular culture. Avatars are not taken literally but rather allow for an iconic

representation of what the user is doing at the time. For example, the use of the martini glass to indicate that one is 'out on the town'.

She also notifies specific friends who she really wants to see by sending the avatar of her with a martini glass to their virtual lounge rooms. She attaches the voice tag "At Amber Lounge with Sarah. Here until about ten. Come down."

The use of avatars can be proactive and when the owner of the phone wants to actively engage a person or group of people they can choose the appropriate avatar from their avatar menu list and send it to wait in the relevant persons' virtual lounge rooms. The avatars serve as notifications. The virtual world controls the real world.

Both girls order a snack and a drink and leave their mobile devices on in front of them on the table. Not only are they engrossed in a conversation with each other but also are aware of the comings and goings in their virtual lounge rooms. Assorted friends drop in both in real life and virtually. Jade has a quick video conversation with a group of friends in London and touches base virtually with her parents. She meets her boyfriend in his virtual café and they exchange virtual kisses. In real life he is still at work.

This phone facilitates both real life and virtual contact amongst friends and supports the seamless transition between the two.

Jade uses the picture and video options on her phone to put 'up to the minute pictures' on the 'walls' of her virtual lounge room.

The owner of the phone is able to customize the look of their virtual lounge room and make it reflect a continual digital representation of the user's real life. This can act as an incentive for those not there to join her (or perhaps to not join her) or to allow those who cannot be there to 'get the picture'.

And so the night continues…

End of scenario

9.1 SWARM SPECIES

The fact that a written scenario was able to generate concrete outcomes is a credit to the interaction between user needs researchers, the technologists and the users themselves. As will be discussed in the next section, the Swarm Scenario-Prototype, presented above, went on to have many incarnations that were used in a variety of contexts. Each of the designs embodied a different element of the Swarm, rather than incorporating all the functionalities of the original scenario.

Within the SITCRC, two separate demonstrator models were built for the Architecture project, 'Pre-Swarm' and 'Swarm++'. A separate SITCRC research group, the Nymity Project, was concerned with the development of technologies for digital identity management. They used elements of the Swarm as a digital wrapper for use in other domains. 'Malleable Swarm', was the result of collaboration with Sony CSL in Paris and involved avatars embedded with music to facilitate new forms of social interaction. Finally, 'Mobile Message Technology Swarm' is currently being developed that moves away form the use of avatars and allows the user to represent their current status via color.

- Pre Swarm: Encapsulates the idea of 'passive' and 'active' scheduling. It has been created using two hand-held Ipac computers. The general approach used to create the demonstration was one of blackboard management. Pre-Swam was demonstrated and proved to be workable.

- Swarm ++: Separately, a model of requirements for the Swarm application was constructed and verified as workable. The potential to provide interactivity though the use of avatars embedded in environments with immersive audio properties was an extension of Swarm++.

- Identity Management Swarm: The Nymity project is concerned primarily with issues of digital identity management across domains and it was thought that the Swarm could provide a wrapper through which users could consolidate their digital identity in different areas such as health, finance, e-commerce as well as personal communications.

- Malleable Swarm: In conjunction with Sony CSL, Malleable Swarm was developed to act as a community shared and avatar-driven mobile music system for sharing and

remixing music among friends. It works on a system of ‘sonic avatars’ that allow music to be remixed as a form of social interaction.

- The Swarm Mobile Message Technology: Engages preset colored avatars to display user status. More context and personalisation can be added by the user in the form of mood and activity icons that can dragged onto the avatar.

9.2 Pre-Swarm (Giving Serendipity a Nudge)

Pre-Swarm was the first prototype to be developed. Through the use of ‘passive’ and ‘active’ scheduling, Pre-Swarm allowed the user to manage their digital presence in a manner that provided varying degrees of interaction with the actual device. This was embodied by ‘passive’ and ‘active’ scheduling.

9.2.1 Passive Scheduling

Passive scheduling means the user programs an avatar to convey what they are doing by displaying a specific avatar in their virtual lounge room. Friends can then check the status of the avatar and decide if they wish to contact the person or not. For example, it might be inappropriate to call a person if it is Sunday morning and the avatar indicates they are asleep, or, if the avatar indicates they are on a date.

A certain amount of initial effort is required to program the avatars, especially if they are going to reveal different activities to incoming callers; however, once they are in place, the need for unnecessary real time interaction is reduced.

Passive scheduling can involve three degrees of user input:

1. Low level of involvement: The depiction of a general activity such as ‘work mode’ for weekdays or ‘leisure mode’ for weekends requires minimum effort on behalf of the user. The application of this type of avatar is a simple way for the user to provide a general sense of what they are doing. For example, ‘leisure mode’ would indicate to callers that that the person is free for the day and that they should get in touch if they want.

2. Medium level of involvement: The depiction of a short-term activity such as ‘at the movies’ requires more input from the users, however, indicating a specific activity can be of great benefit, giving serendipity a nudge for friends who may be in the vicinity and want to catch up.

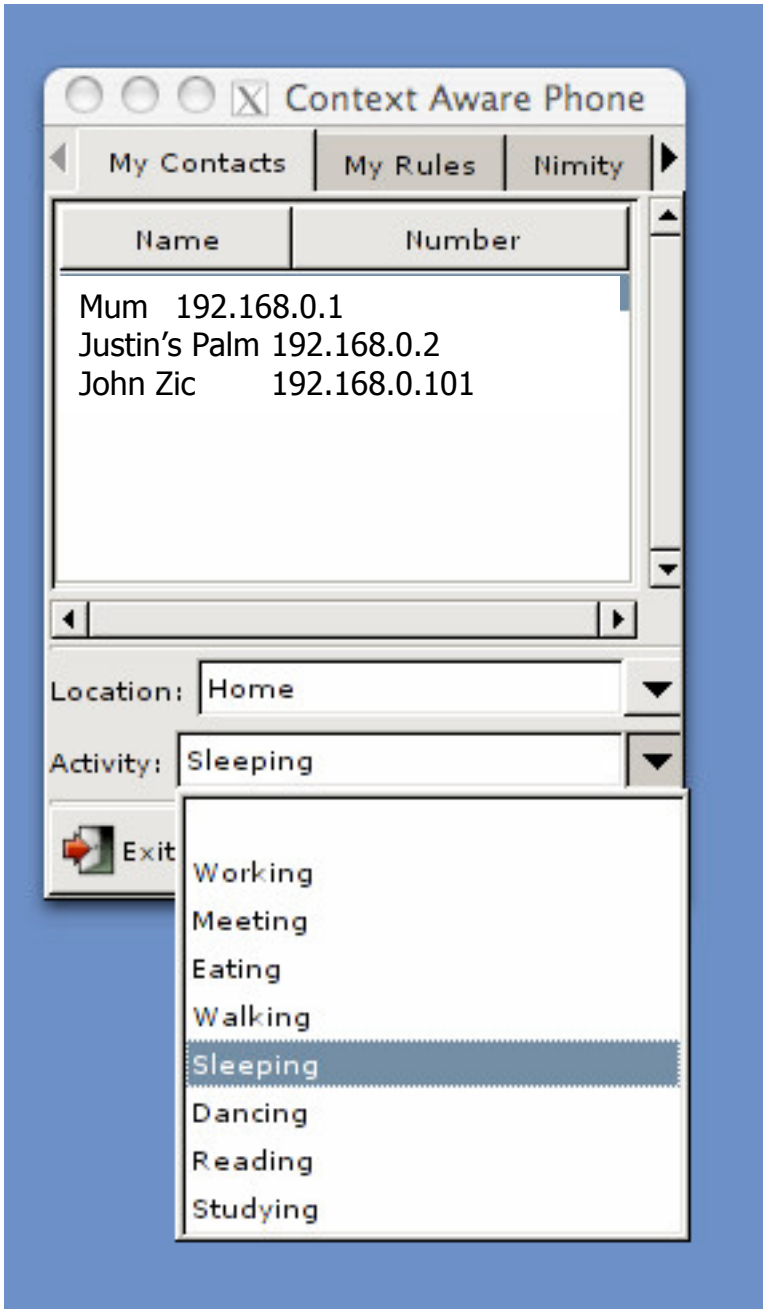
3. High level of involvement: A direct message can be tailored for an incoming caller. This requires significantly more effort of behalf of the user; however, there is direct benefit if a person cannot answer their phone but needs to convey a specific message to an incoming caller.

9.2.2 Active Scheduling

The user selects an avatar, embeds it with a text and/or voice message if needed, and sends it to occupy another person’s mobile phone interface. This is active scheduling and is useful when the user wants to notify a person of an activity who might not otherwise call. It also cuts down on real time interaction.

9.2.3 Rules Lead to an Activity Aware Function

In order for Pre-Swarm to meet its full potential, rules of behavior are integral, allowing the user to simultaneously convey multiple avatars to incoming callers. The architecture of the system was designed to allow users to program contacts and apply contextual rules that would determine what information is embedded in the avatars (see figure 3.). Essentially, this embodies the Swarm Scenario-Prototype by creating an ‘activity aware phone.



Contacts and Context Setting

Note that context is under user control in this prototype.

Future prototypes will automatically add contextual information.

Figure 2. Context Driven Design

Created by Justin Lipman and John Zic. Demonstrates how Pre-Swarm allows users to program contacts and apply contextual rules that would determine what information is embedded in the multiple avatars incoming callers see.

9.3 SWARM ++ A BUFFER BETWEEN CONNECTIVITY AND CONTACTABILITY

Swarm++ has two parts, the 'foyer' and the 'interaction' rooms. The first part of Swarm++ concentrates on the user need for a buffer between connectivity and contactability provided by the Swarm Scenario-Prototype's virtual lounge room. To address this problem, Swarm++ provides a virtual 'foyer' that acts as the first point of contact for visitors to the phone (see figure 4.). The user's avatar resides in the foyer and greets the caller. In this sense, the foyer manages the incoming calls according to user profiles that have been set up by the owner of the phone.

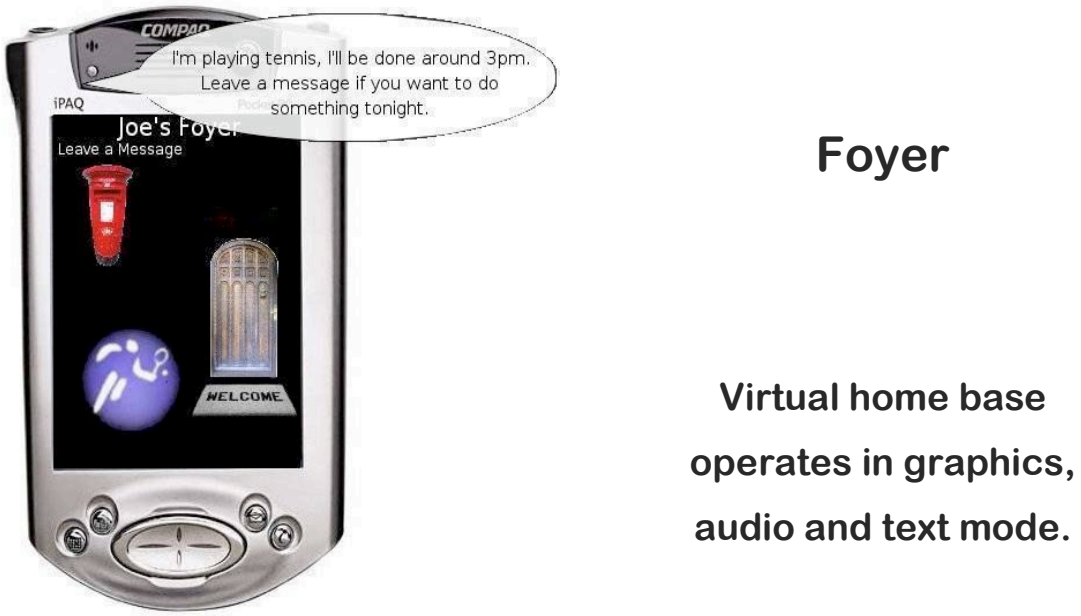


Figure 3. Virtual Home Base
By Chris Johnson and Sam Holden for the Smart Internet Technology Architecture Project. Demonstrates the Swarm's foyer where an avatar embedded with sound provides information to incoming callers.

9.3.1 Defining Rules and Creating Avatars

As with Pre-Swarm, a major concern for achieving the goals of Swarm++ was implementing a rule based systems for managing different categories of incoming callers. The use of 'ripple down rules' (Srinivasan, et al., 1991) helped to overcome this problem.

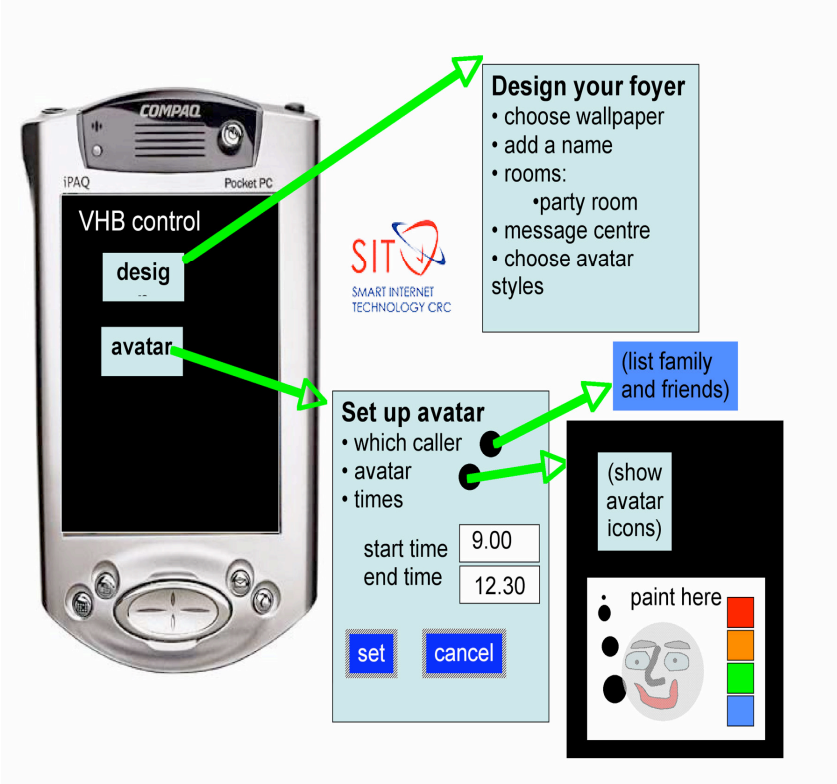


Figure 4. Digital Identity Creation and Management
By Chris Johnson and Sam Holden for the Smart Internet Technology Architecture Project. Demonstrates how the user sets up the rules by which incoming callers see the appropriate avatar. Also shows how the users can design their own avatars.

9.3.2 Access for All and Context Aware Representation

Swarm++ allowed users to create their own avatars to represent their current activity However, it was noted that the applications should be able to operate across a number of platforms and not exclude users who only communicated through text based phones. Therefore, although Swarm++ was designed with graphical interfaces and audio systems for 3G and beyond devices, it would also work on more primitive phones, allowing the user to convey their activity trough the use of text or audio based systems

Multi-modality had the added advantage of allowing Swarm++ to work as a context specific device. For example, if the user was driving, audio only mode could be activated, if the user was in a theater, image without sound mode could be engaged.

Context Appropriate Mode

For example, in driving mode there are no graphics or text, only audio.

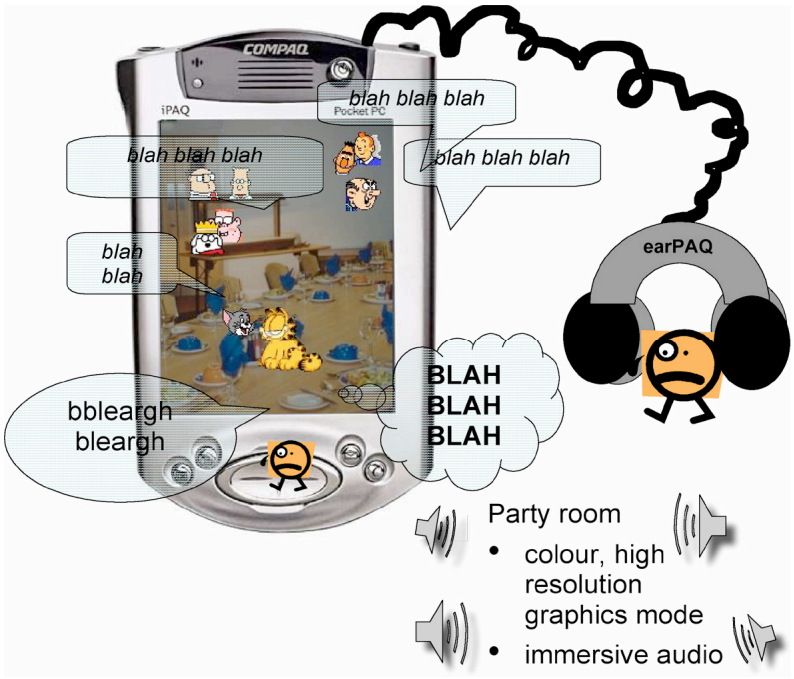
Figure 5. Context Driven Multi-Modal Design
By Chris Johnson and Sam Holden for the Smart Internet Technology Architecture Project. Demonstrates the Swarm working via audio text only mode. Provides access for users with 2g phones as well as allowing use in a range of situations such as driving.

9.3.3 INTERACTIVITY

The potential interactivity of the Swarm was factored into Swarm++. Just as a house contains rooms where people can congregate, Swarm++ provides virtual rooms where one or more social groups can spontaneously come together to interact. Those present are represented by their avatars and are able to communicate with realistic audio sound[5]. This iteration of the Swarm supports multiple virtual rooms operating at one time and allows the owner of the phone to move seamlessly between them.

Different groups of visitors would be assigned their own levels of access. For example, closer personal friends would have greater freedom to join the interaction in all the different rooms, while other visitors would be restricted to a main room. The rules that were applied to managing which avatars were revealed to incoming callers were applied here. The architecture was in this way, reusable.

[5] Conducted in conjunction with Farzad Safaei and the DICE project.



Interaction

Communicate with each other through avatars in an immersive audio environment.

Figure 6. Facilitating Interactivity
By Chris Johnson and Sam Holden for the Smart Internet Technology Architecture Project. Demonstrates the Swarm operating in Interaction mode that allows users to come together via their avatars to interact.

9.3.4 SUMMARY

Both Pre-Swarm and Swarm++ worked smoothly in terms of providing users with a digital architecture that allowed the construction of a dynamic, shifting, personalized, digital identity. Further work is needed to create the interface that can facilitate the intersection between the user, the Swarm artefact and the construction of identity.

9.4 DIGITAL IDENTITY MANAGEMENT SWARM (REUSING THE ARCHITECTURE)

It could be seen that the Swarm's digital architecture could be 'reusable' and provide a wrapper for other applications. With this in mind, The Nymity project, which is a separate research group within the SITCRC, concerned primarily with issues of digital identity management across domains, used the Swarm as a wrapper through which users could consolidate their identity in different areas such as health and finance. For example, as well as having the Swarm's pre-existing avatars that are essentially 'social interaction selves' there could be an avatar that was an 'e-commerce self' that was imbedded with or could access relevant banking information. When the user wanted to make an online purchase, they would simply click on this avatar and be secure in the knowledge that their digital identity would only reveal the specific financial information that needed to be given out.

9.5 MALLEABLE SWARM (SONIC AVATARS)

A version of 'Malleable-Swarm' (Tanaka, 2004), was developed in conjunction with Sony CSL Paris and demonstrated at SIGGRAPH 2005 (see Figure 8.). It is a future convergence device merging Walkman and mobile phone, avatar-driven, mobile music system for ad-hoc shared listening. It allows people to create virtual identities, providing a means of finding friends and community.

A "sensor subsystem" - miniaturized force sensing resistors, accelerometers, and gyroscopes - detects wearers' gestures while they listen to music. Communication happens not just through voice and text, but via *sonic avatars*. Friends log into the system to shape a common stream of music together. Social interactions drive digital content, empowering the user with the 'face' of their musical identity – creating the 'social re-mix'.

Four key points of the Malleable-Swarm:

- An avatar-driven mobile music system
- A “sensor subsystem” captures wearers’ gestures while listening.
- Communication happens via sonic avatars - virtual identities created by the user.
- Friends create a ‘social re-mix’ - a shared musical experience.

Figure 7. Malleable Swarm.
Atau Tanaka from Sony CSL Paris and Christine Satchell of Smart Internet Technology demonstrate Malleable Swarm, a community shared and avatar-driven mobile music system for sharing and remixing music among friends. Picture from Wired Magazine Digital News (2005).

9.6 THE SWARM: MOBILE MESSAGING TECHNOLOGY

At the time of submission of this thesis, the Swarm Mobile Messaging Technology prototype (see figures 9 – 13) was being developed for the Smart Internet CRC in conjunction with Flash animator and XML programmer 'pixelshifter' (also known as Scott Ritchie). This version of the Swarm was initially developed to be icon driven, however; on viewing the first iteration the multiple symbols looked cluttered on the small real-estate display of a mobile device. An alternative solution was needed and to achieve a cleaner interface, a generic male and female avatar was developed. In order to provide clues as to the users' current activity, each avatar was color-coded. A pull down menu revealed a color chart that mapped each color to a user activity, for example, a pink avatar denoted 'leisure mode'.

Although more research is needed, early testing of the design indicated that users will quickly come to associate a color with a specific activity. As one participant noted, color associations are quite powerful. "I think that I would quickly come to recognize which color represented which activity. After all, that is the main way I browse through my record collection. I know that the blue CD spine is the Nirvana album" (Simon, 29, IT specialist).

The use of color-coded avatars represented a significant challenge in regards to how the Swarm might provide users with the ability to personalize their digital identity. For users to be able to associate 'color' with 'activity' there had to be continuity in that the device would not work if one person's pink avatar meant 'leisure mode', while another person's pink avatar meant 'at work'. To overcome this problem, pre-defined colored avatars were necessary. To still allow users the freedom to personalize their digital identity by creating their own categories of representation it was decided that the pre-defined avatar categories would be kept generic. For example, 'at work', or 'socializing'. Users could then add their own layers of context and personalization by embedding one of the colored avatars with icons or messages of their choice. For example, the user might want to embed the pink 'leisure mode' avatar with an 'at the movie icon', or embed the green 'in a meeting' avatar with a voice mail message for a specific incoming caller. The yellow 'holiday mode' avatar might be embedded with a tropical island icon. This represents an extra degree of user programming that requires more work and some users may never venture beyond the color coded categories. It does, however, provide the opportunity for greater contextualization and personalization should the user so desire.

From a technical perspective, this version of the Swarm is being out-putted onto a laptop screen that would mimic a Dell X51V that has a resolution of 480x640 and a real screen size of 3.7 inches (9.4cm). The coding is being carried out in such a way that it can be demonstrated on the Dell as well as running on windows.

A) The main avatar represents the user.

B) The color bars represent different modes of representation the user can simultaneously convey.

C) The small avatars at the bottom of the screen display what the users' friends are doing now.

D) Use the color bars as a pH tester to see what the color-coded avatars mean.

E) Symbols and icons embedded in the avatars provide additional context.

F) When people visit the phone the user will appear as a colored avatar on their device.

Figure 8. Main Screen

Figure 9. What are my Friends Doing Now?

G) To see more about what the users' friends are doing now click one their little avatars. (C in the previous screen).

H) When the little avatars are clicked on this screen pops up which reveals the comings and goings of the friends in the users' contact list.

Figure 10. Programming Presence

I) Click on the top right hand button to bring up list of contacts.

J) This shows what the user is currently revealing to each person. If the contacts were organized into groups it would indicate what each group, such as friends, work contacts and family was seeing.

K) The color bar remains visible on the left side of the screen and continues to act as a pH tester for modes of representation.

L) Although it is unlikely that the user would convey as many different things simultaneously as is demonstrated here, this example is helpful in showing the broad range of activities, moods and modes the Swarm allows the user to express. For example, the user is conveying sleep to Greg and indicating Greg should not call. Jane sees that the user is driving and would like her to make contact via SMS.

M) To assign or change which color-coded avatar is revealed to each contact, click on the person. Then select the desired representation from the color bar.

N) To see what the users' contacts see when they call me click on the colored bar (see B on screen one). For example, clicking on the orange social bar brings up the contacts that see the user is socializing.

O) Extra context is added through symbols. In this case Ben sees that the user is at a bar (indicated by the Martini glass icon). Darren sees the user wants him to call (the phone icon) and also that the user is at a bar. Vicki sees the user is at a bar and also on a date (the love heart).

Figure 11. What I am Doing Now?

P) To add context icons to colored avatars, click on the icon button.

Q) This brings up the list of icons. Although the swarm comes with a set of initial mood, mode and activity icons more can be downloaded from the Internet or created by the user themselves.

R) To assign or change what icons are assigned to be revealed to different people, click on the contact then select the color-coded avatar. Then open the icon button and click on the desired icons .

Figure 12. Adding Context Icons

Figure 13. Incorporating user produced content

S) The camera icon next to Fiona's name indicates that she has a digital image she wants the visitor to view.

T) When the camera icon is rolled over or clicked on it the digital image opens up to full screen size.

U) By providing users with the ability to capture and display 'up to the minute pictures' the owner of the phone is able to create a virtual presence that reflects a continual digital representation of their real life. This can act as an incentive for those not present to join them or allows for those who cannot be there to 'get the picture'.

9.7 SWARM PATENT TECHNOLOGY DESCRIPTION

Many different Swarm species evolved; however, in order to stay true to the original user needs identified in the study, it was the original scenario-prototype that was embodied by the patent. The details are provided below.

- SWARM is a system that allows communication device users (e.g. mobile phone users) to communicate on their behalf to people who are trying to contact them using one or more avatars.

- This removes the need for the user to interact with the device and interrupt their current activity if someone attempts to contact them when the activity is one that should not be interrupted.

- The selection of what avatar is used depends on who is trying to contact the communication device user, where the communication device user is currently located, and what activity the communication device user is currently engaged in.

- SWARM also allows a user's communication device to communicate with others via the placement of avatars in one or more virtual environments thereby allowing virtual communities to form involving multiple people.

- People wanting to contact a person or persons now do so by joining the virtual environment, which then relays the appropriate avatar to them.

- In both cases, regardless of whether or not the contact attempt is being made directly or via a virtual environment, permission must be given to receive an avatar or join the environment.

9.8 Future Considerations: Convergence: Eroding the Mobile Phone Space/Internet Space Divide.

In order for further developments of the Swarm Scenario-Prototype to stay true to the needs of the users who drove the design, its functionality must be continually repositioned in light of the ever-changing nature of the mobile artefact itself. Mobile phones are now highly converged devices and one of the most significant intersections is with the Internet.

The convergence of the mobile phone and the Internet, while endlessly beneficial from a utopian perspective, can also lead to potentially dystopian outcomes. It can be seen from the study that users perceive mobile phone space and Internet Space as two, very different things. These differences are worth noting. They provide guidelines for the future development of the Swarm, and more importantly, could contribute to mobile phone design in general. With Intel predicting that by 2010 there will be "more than 2.5 billion wireless handheld devices communications functions combined with the processing power of today's advanced PCs Intel" (Maxwell, 2003, p.160), it can be seen that the implications of the convergence of the two technologies warrants critical analysis. Although it is the compatibility between the two devices that are note worthy, it should be considered that the intersection of the mobile phone and the Internet in one device represents a potential clash between to different philosophies.

9.8.1 The Distinguishing Features of Mobile Phone Space

The Swarm draws on the intimacy and trust users have with mobile mediated communications by providing a peer-to-peer, 'walled garden' interaction space where small networks of established friends, who have regular face-to-face contact, can find each other.

This provides a useful lens to reflect upon the nature of mobile phone space itself, which was seen by users in the study as intimate, walled, personal and safe. The true nature of your location or activity may not be exactly as you portray it and that is a major appeal, but there is no doubt that you are who you say you are. In contrast, the Internet is un-patrolled, impersonal, and unsafe. You may be who you say you are, or you may be someone else. This means that identity is created very differently in these two spaces.

The Internet facilitates anonymity or multiple identities and allows for multiple users of one device. On the other hand, the mobile phone is an extension of the owner[6]. This is an important distinction that reminds us that just because a mobile phone can be a portal to the Internet, does not mean users will want to bring the 'wild west' paradigm that can characterize Internet communications into mobile phone culture.

New Paradigms of Social Interaction

Unlike Internet chat and e-mail that rest on the assumption that the user is in one spot, the Swarm is a response to mobility. As such, it facilitates the creation of activity based avatars that can be mapped onto ever-changing locations and everyday events. The user can provide their chosen friends with a continual account of their activities. Ultimately, this gives serendipity a nudge in the form of facilitating interactions with individuals or groups who may be in the same vicinity.

The documentation and dissemination of current activities (for example, through the use of text or picture messages), coupled with simultaneous coordination of the next event, culminates in a shift in the nature of communication itself. Unlike Internet chat or even e-mail, the driving force behind the interaction is not about back-and-forth interaction with someone else. Mobile phones facilitate a more subtle form of interaction, where communication is managed through the creation, circulation and consumption of virtual presence.

Reduced Real Time Interaction

The uptake of asynchronous interactions within mobile cultures was inexorably coupled with the need for a mechanism that could reduce unnecessary real time interaction. The Swarm responded to this by providing a virtual home base that acts as the first point of contact for visitors to the phone, thus 'connectivity', is tempered with control over 'contactability'. While real time interaction is achievable with Swarm++ through the use of the 'Interaction Rooms', an important requirement was for a new mobile technology that reduced, rather than increased real time interaction.

[6] It is noted that there are exceptions to the personalisation of mobile phones. For example, in some Bangladesh villages, many users share a single mobile phone.

9.9 Conclusion: Nurturing User Trust

There are many benefits to the convergence of mobile and Internet technologies, yet it was evident that further development of the Swarm should not segue into traditional Internet chat or e-mail platforms, instead, the unique qualities of mobile phone space should be embraced and perpetuated. This indicates that an important perspective for the design of a future mobile artefact is one where the values and philosophies that are embedded in the mobile device are protected. Thus, the hard won trust users have in their mobile artefact can be nurtured through the continued interactions that take place in 'friendly' mobile phone space.

CHAPTER 10

CONCLUSION: UTOPIAN AND DYSTOPIAN OUTCOMES

The aim of the research conducted for this thesis was to investigate the social and cultural intricacies of young peoples' use of mobile phones in terms of design. It was undertaken so the insights could provide the SITCRC with information that could contribute to the development of new technology. The aim of the research was met and a series of Swarm mobile phone prototypes were developed in response to the users' needs. These prototypes were based on the initial 'Swarm Scenario-Prototype'. They took cues from user led innovation and extended to the user multiple avatars that allowed individuals to define and manage their own virtual identity. They provided contextualization and personalized information, and allowed users to maintain a constant digital presence without the intrusion that continuous connectivity could bring. In order to achieve this outcome, a new theory driven design methodology was developed. This methodology contributed to knowledge by introducing cultural theory into human computer interaction and injecting unexpected use into user centered design. This chapter will further elaborate on how the research aims of this thesis were met by summarizing the key findings generated by the four research questions and describing their contributions. It will then summarize the contributions to knowledge and design ending with areas of future research.

10 WHAT DOES THE CURRENT LITERATURE TELL US ABOUT YOUNG PEOPLES' USE OF MOBILE PHONES?

The literature review encompassed a range of texts from a variety of areas - social and cultural analysis, marketing reports, industry sponsored research and HCI. The results provided compelling insights into the social shaping and cultural implications of mobile phone use.

The social and cultural perspectives of youth culture and mobile phone use revealed that the mobile phone was an artefact that had transcended its functionality as a communication device and become loaded with social and cultural meanings. Furthermore, although there were many examples

of use that were representative of localized practice, it was the similarities, rather than the differences that were significant.

The market analysis literature focused on mobile phone use within youth cultures for the purpose of understanding use in order to increase consumption. Although this positions the market research in a different ideological sphere to the texts from the cultural and social critiques, the findings from these two areas converged. Both identified the mobile phone as integral to young peoples' formation of friendship networks, the sharing of their experiences and finally, the identification of their roles within their social worlds. The marketing literature also explored new and innovative ways in which mobile technologies are being augmented with new functionalities. This highlighted the potential for the mobile phone to become a site for the introduction of new personal technologies.

The industry-sponsored literature was characterized by multi-disciplinary collaborations between industry and academia. The result was in-depth investigation of young peoples' use of mobile phones coupled with observations about effective methodological strategies for studying mobile phone use. Literature from this perspective explored the phenomenon of the 'early adopter' and contrasted use across geographical and generational user groups. In keeping with the findings from the social and cultural critiques and the market analysis, the research found that young people are a unique user group who differ from other generations.

The human computer interaction research converged with the findings from other disciplines and found that the mobile phone is integral for young people in terms of expressing their identity.

The findings from the varied literature raised two questions. What is it about the social and cultural conditions surrounding mobile phone use and about the device itself that has elevated the mobile phone from communication tool to celebrated artefact? What are the implications for the design of future technology? These findings pointed out the need for techniques to leverage these insights into practical future mobile phone design concepts. Conducting a user study that would address such issues represented a challenge for the design of future mobile technology. A unique methodological approach for conducting a user study that could understand these subtle nuances of use in terms of design was needed.

10.1 WHAT IS AN EFFECTIVE MULTI-DISCIPLINARY METHODOLOGY FOR A USER CENTERED DESIGN STUDY OF YOUNG PEOPLES' USE OF MOBILE PHONES?

Much consideration was given to addressing this research question and deciding which disciplines should be incorporated into the user centered design process. A multi-disciplinary approach was developed that included qualitative research for gathering user requirements, cultural theory as an analytical lens to aid in the translation from user needs to design implications and scenario based design for communicating the findings to the user centered design team.

Qualitative studies and scenario based design are frequently used as components of multi-disciplinary research within HCI. It is the application of cultural theory to HCI and more specifically, to user centered design that has provided the original component of the design methodology and established a fundamental contribution to the field.

The research presented in this thesis contributed to knowledge by explicitly stating how abstract cultural theory concepts could be employed as lenses for analyzing qualitative user studies and translating them into user needs and design implications. Through the process of signposting the intersection of user centered design informed by cultural theory, the benefit to the design space has been highlighted. In much the same way that a system of checks and balances cross-validates complementary design techniques such as qualitative research and grounded theory building, the introduction of cultural theory into HCI brought in a philosophical element that helped explore user needs in terms of design.

10.2 WHAT ARE THE USER NEEDS OF YOUNG PEOPLE THAT CAN BE ADDRESSED WITH A DESIGN SOLUTION?

The user study revealed that the mobile phone was integral in the formation of fluid social interaction and had accelerated urban mobility. Users once restrained by pre-made plans were able to spontaneously traverse the city and suburbs, swarming between friendship groups and activities. The consequence of this mobile facilitated social networking is the blurring of the boundaries between real and digital interaction.

Specifically, the user study generated five key insights into young peoples' use of mobile phones:

1. There were distinct archetypes of mobile users; nomads, iconics, updaters and resistant users.
2. Mobile facilitated communication had become integral to the creation and maintenance of social networks.
3. Users wanted connectivity, yet they also wanted control over mobile generated space.
4. The mobile artefact has become symbolic of the users' sense of identity.
5. As the mobile phone converged with other devices and services such as digital cameras, MP3 players and the Internet, users were becoming active creators and distributors of content.

The findings from the user study revealed a clear picture of the mobile phone practices of young people living in Melbourne, Australia. These contributions to knowledge were important in their own right. However, an additional contribution of these findings was realized through their translation into user needs and ultimately, design implications. These emerging social trends pointed out the need for new analytical tools to aid in the design process of products that could serve this new generation of user.

10.3 How can user needs identified in the study be translated into design?

This research question was addressed in two stages. The first stage employed cultural theory as an analytical lens to translate user needs into design implications. The second stage used scenario based design to embody user needs in a way that could be communicated to the User Centered Design Team, the researchers in the SITCRC and the industry partners.

The application of abstract cultural theory concepts to the practical act of translating user needs into design was beneficial and contributed to knowledge on many levels, most notably, through the exploration of utopian and dystopian outcomes.

The exploration of utopian and dystopian outcomes revealed that 'unexpected use' played a key role in determining success or failure of a design. Utopian ideals were embodied by users who gained pleasure in using technology in new and innovative ways that were not necessarily intended by the designer. On the other hand potentially dystopian outcomes were averted by users engaging with technology in unexpected ways to overcome design limitations. It could be seen that a new generation of users was imposing their own modifications onto their mobile technology. This led to

a culture of use involving re-contextualization and personalization. Only then does the design lose its pre-programmed, mass-produced, big corporation identity and become desirable.

These insights are valuable and suggest two principles. The first is the importance of user led innovation. Users not only identify problems, they can also provide solutions. The second is that the design of future technologies themselves should allow for greater personalization, contextualization and freedom of use. The Swarm Scenario-Prototype and the physical prototypes it generated embodied these principles. By taking cues from user led innovation, these designs provided users with personalization over their digital identity and greater control over their digital worlds.

The final contribution to knowledge from this thesis came from the highly 'design solution specific' nature of the Swarm Scenario-Prototype itself, which incorporated the prototype as an extension of the analysis of user needs. This technique of 'Scenario-Prototyping' aided the development of the physical design by providing a template that the computer scientists could use to ensure the Swarm mobile artefacts stayed true to the original user needs.

In summary, the research presented in this thesis makes distinct contributions to knowledge:

1. A cultural theory driven design methodology that introduces cultural theory into human computer interaction.
2. Insights into the intricacies and nuances of young peoples' use of mobile phones in Melbourne, Australia.
3 The framework of utopian and dystopian outcomes that injects user led innovation within the user centered design process.
3. A series of Swarm mobile phone prototypes.
4. The methodological technique of 'Scenario-Prototyping.

The research displays rigor and resiliency in the fact that it led to a technology patent application. Moreover, the project continues in development for possible commercialization by the SITCRC. This research, thus, has made contributions not only to the field of user centered design research, but also to the industrial entities that supported this work.

Finally, the contribution of this research can also be viewed from the perspective of the potential users themselves. At least 50 web sites, including New Scientist, Yahoo India, Netscape and IEEE have sprung up discussing the Swarm. This has lead to bloggers testing out the interactive web version that is currently available online (http://pixelshifter.net/client_login/swarm) and reporting back on its social and cultural usability. This Internet chatter has been catalogued and provides valuable insights into what aspects of the Swarm are 'user friendly'. The process of analyzing the web sites, blogs and discussion threads not only helps to ensure the rigor of the current prototype, it brings in a new set of users whose needs can be incorporated into the next iteration of the prototype thus further democratizing the design process.

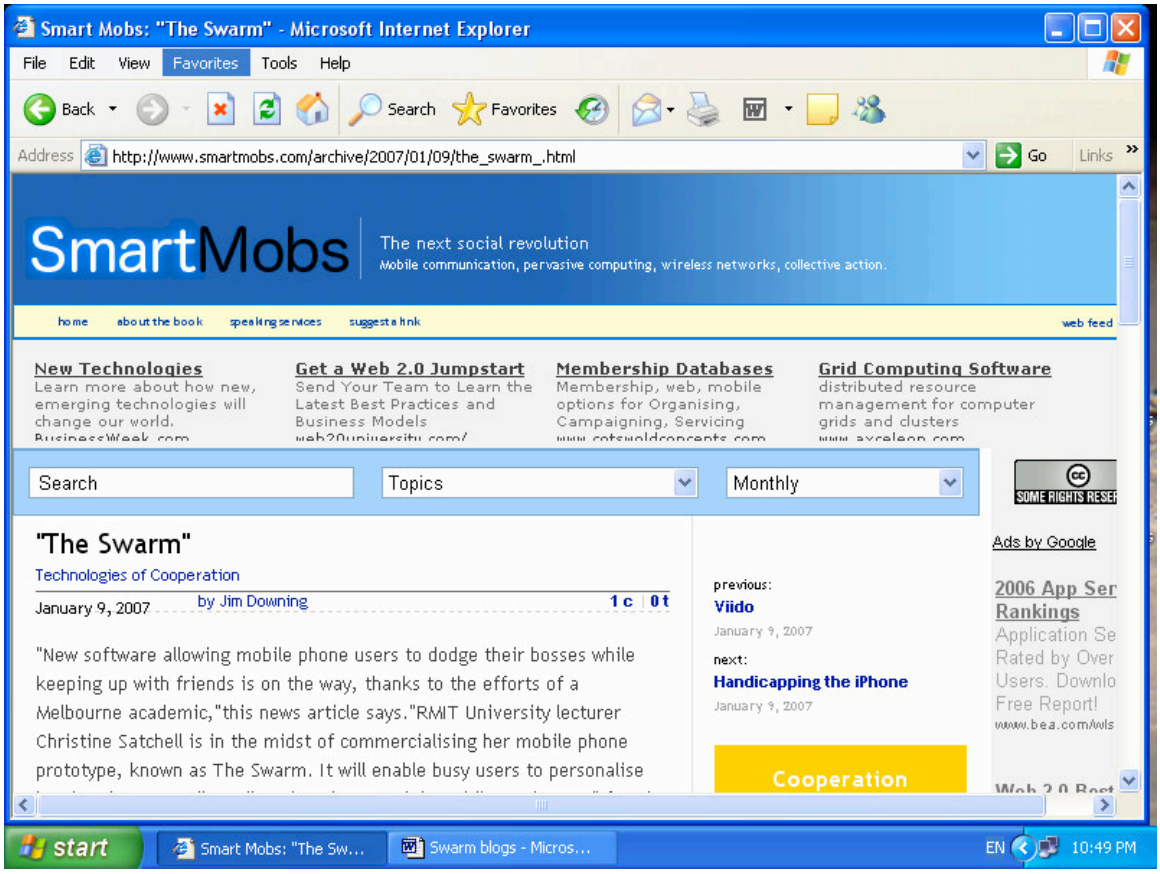
Selected screen shots of web pages, reviews, discussion threads and blog extracts are presented below:

Site: Smart Mobs

Title: The Swarm - Technologies of Cooperation

URL: http://www.smartmobs.com/archive/2007/01/09/the_swarm_.html

Date Accessed: Jan 17th, 2007



Extract: Because the human identity is a bit more complex than just one representation, we needed to be able to represent multiple things at once.

Site: Experience Mobility.

Title: A Swarm of Activity

URL:http://experiencemobility.com/wordpress/?p=1302

Date Accessed: Feb 12th, 2007

Extract: Lets talk about “the social” but in a slightly different way than you think… Hopefully it (the Swarm) will blend social networks allowing interactions when they are most appropriate.

Site: New Scientist.

Title: Cell Phone Tells You What Mode You Are In

URL:http://www.newscientisttech.com/article.ns?id=dn10862&feedId=tech_rss20

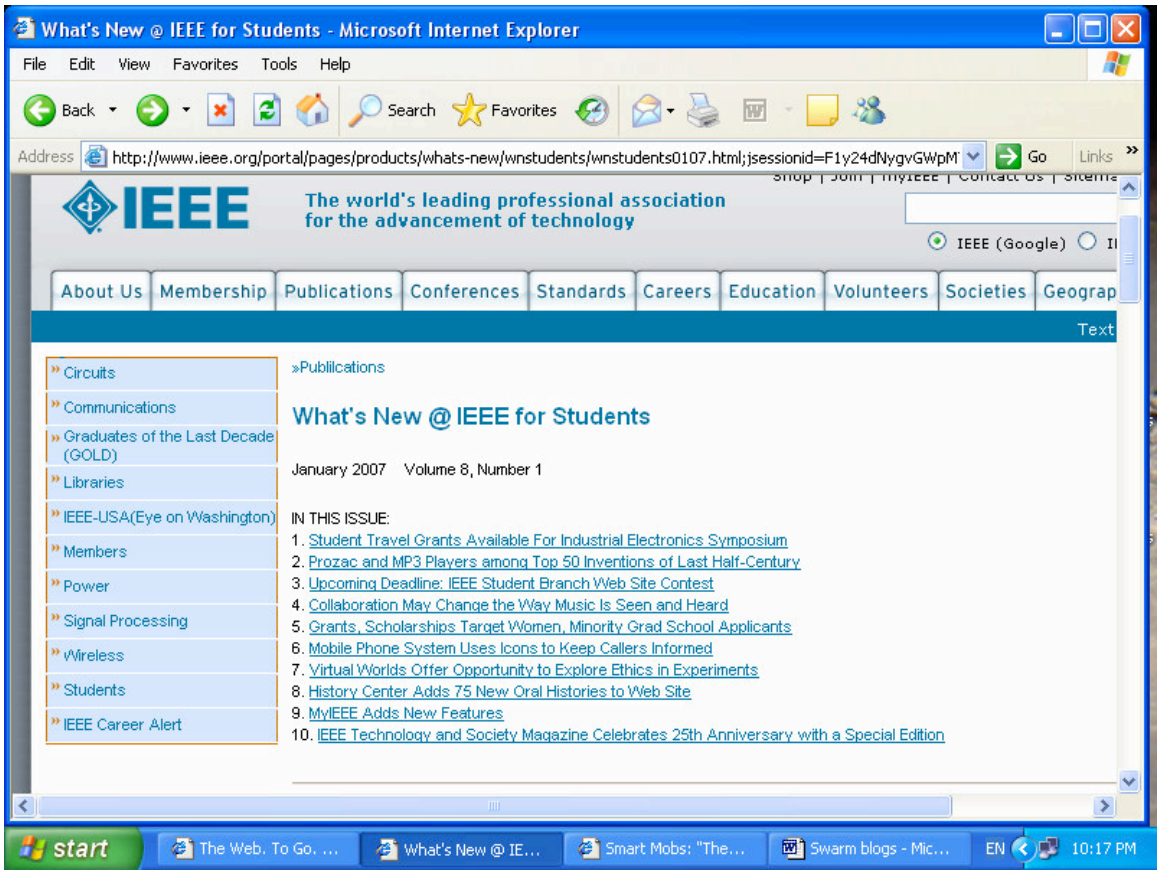
Date Accessed: January 3rd, 2007

Extract: Sneaking off work early for Friday afternoon drinks will soon be made easier by a mobile phone system that will tell your boss you're still at work while letting your friends know you're on your way.

Site: IEEE

Title: Phone System uses Icons to Keep Callers Informed

URL: http://www.ieee.org/portal/pages/products/whats new/wnstudents/wnstudents0107.html;jsessionid=F1y24dNygvGWpMT3y4x50Bw1SNhWyh2hnMQyvQLnKGvTzSjg1y2k!755817609



Extract: Designed for working people, the Swarm system uses a color-coded icon to determine which six activities the users are currently involved in, including: holiday, social, driving, leisure, sleep, or work. Additional icons can be added to tell users what specific type activity the person they are calling is engaged in.

Site: Yahoo India.

Title: A cell phone system that shows you are at work while being at a party!

URL: http://in.tech.yahoo.com/061227/139/6amaw.html

Date Accessed: Feb 7th, 2007

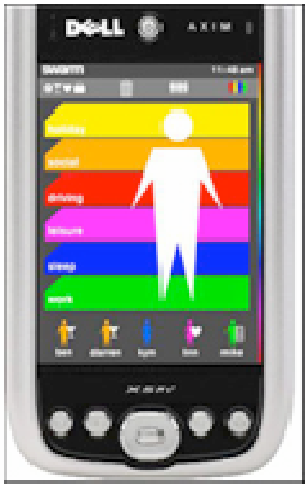
Extract: It just became easier to beguile your already gullible boss, for now you can slink off for an afternoon drink or go on a shopping spree, and a new mobile phone system will tell him/her that you're still at work.

Site: Plusmo

Title: Swarm System tells Users Where There Friends Are

URL: http://www.feedshow.com/show_items-feed=827d58335f062b3ca3374246368ff769

Date Accessed Feb 17th, 2007



Extract: Judges at the recent Under the Radar conference in Silicon Valley chose Plusmo as the winner of its “Mobilize” category. The conference explores hot new companies that are “true innovators fueling an explosion of consumer-created content, thriving user communities, and new business opportunities,” according to the organizers. The Mobilize category looks at innovation in making content mobile. Plusmo was chosen by judges from Motorola, Verizon and Yahoo in a session moderated by c|net’s Rafe Needleman. Plusmo’s three featured mobile technologies (shown clockwise from the bottom are the LG “TV Phone”, Nokia and VISA’s “Mobile Wallet” and The Swarm “Mobile Based Social Networking System”.

Site: WordPress

Title: The Swarm: A software for mobile phones soon to revolutionize relationships between people

Sources: Techno-Science.net, InternetActu, SmartMobs.

URL: http://jeremyfain.wordpress.com/2007/01/22/the-swarm-a-software-for-mobile-devices-soon-to-revolutionize-relationships-between-people/

Date Accessed: Feb, 1st, 2007

Transcript from Blog

People relationships have been evolving quite rapidly recently. If the e-mail has, despite its many flaws, changed the way people communicate, other disruptive new uses like online dating, social networking (professional: LinkedIn; friends on FaceBook; hobbies, etc.), instant messengers (allowing you to let people know whether you're available or not and leave small notes to the attention of your contacts) have sort of opened new paths to getting to know new people, or helping you keep in touch with people you already know. In this perspective, here's something new, both a device and a software.

Before we get going, many thanks to Steve D. (whom you'll hear more about quite soon…) for telling me about this amazing innovation developed by the Smart Internet Technology research group - an Australian digital media think tank, and a researcher at the Royal Melbourne Institute of Technology named Christine Satchell.

The Swarm, that's the name of a software (see picture on the right side of your screen), basically allows you to tell your contacts what you're doing (eg. "In a meeting"; or "I'm driving, not so convenient to pick up the phone"), whether you're available ("I'm sunbathing on the beach so call back tonight please") and when you'll be available ("Free on Saturday night"). You may also separate your professional and private contacts, interface easily the software with your regular digital address book, etc. The software is REALLY EASY to use, and will probably adapt perfectly to the new

“finger-driven phones” trend set by Apple and its iPhone. If you don’t believe me and feel like judging by yourself, check out the interactive demo of Swarm over here.

Responses from Users:

Waoo. That’s a great device; and, yet, not revolutionary. It just combines two things: the new phone mobility (with wi-fi, pocket explorer, wi-max etc) and the social trends (Facebook indeed asks you to set a status to let your “buddies” what you are up to).

JD: The swarm guys were really able to analyze the two trends and to get the most of it. So what it tells us is that: by screening (smartly) the new technological innovations, you might come up with interesting ideas.

I am just wondering: are they developing just the software (that could be installed on any device) or are they actually developing the hardware as well in partnership with a phone maker? (i could not figure that out in the link that you mention).

Comment by Jedi — January 23, 2007 @ 12:24 pm
Not intrinsically revolutionary, probably, but revolutionary in a way that the Swarm shows the way the mobile industry is heading towards.

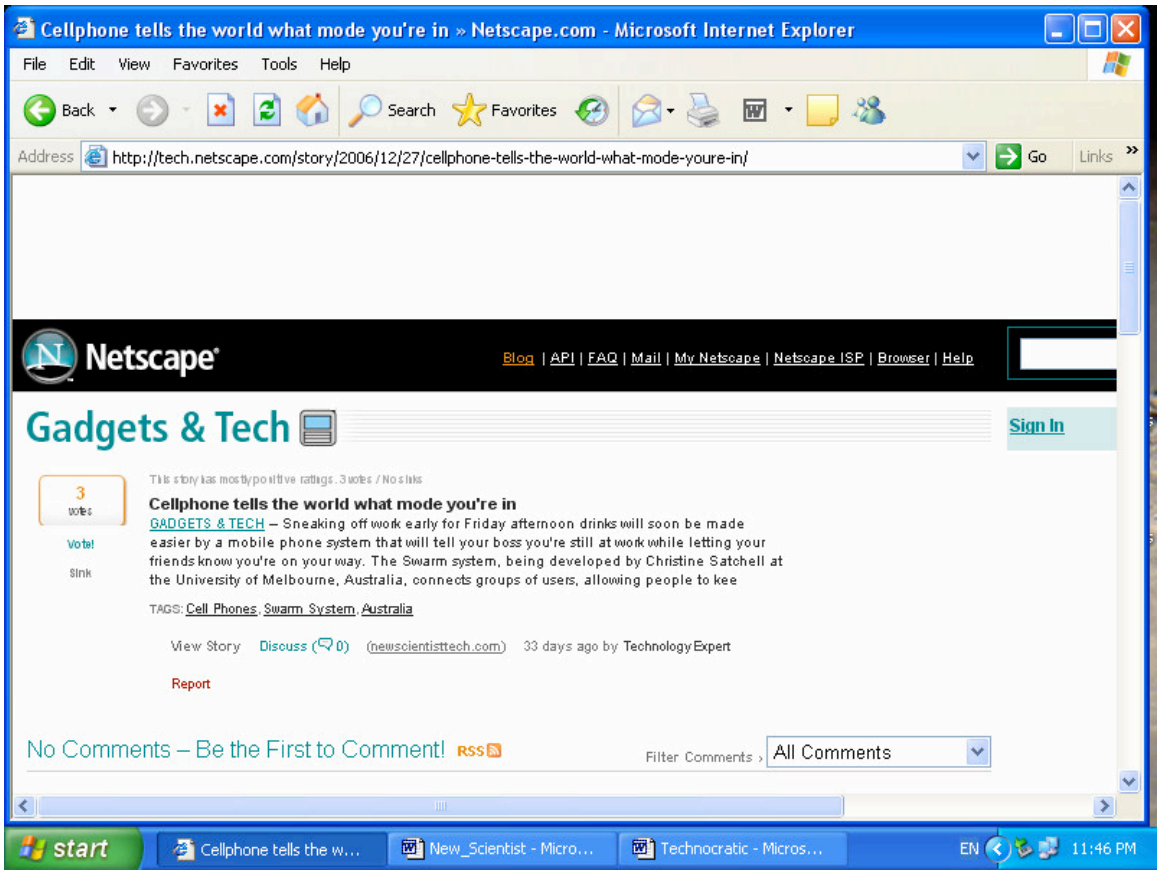
To answer your question - in the third link (SmartMobs), you’ll come across these words: “RMIT University lecturer Christine Satchell is in the midst of commercializing her mobile phone prototype, known as The Swarm.” But business-wise, my guess is that the software is going to be available to all mobile phone manufacturers at a price yet to be determined.

Site: Netscape

Title: Gadgets and Tech - Cellphone tells the world what mode you're in

URL: http://tech.netscape.com/story/2006/12/27/cellphone-tells-the-world-what-mode-youre-in/

Date Accessed: Feb 15th, 2007



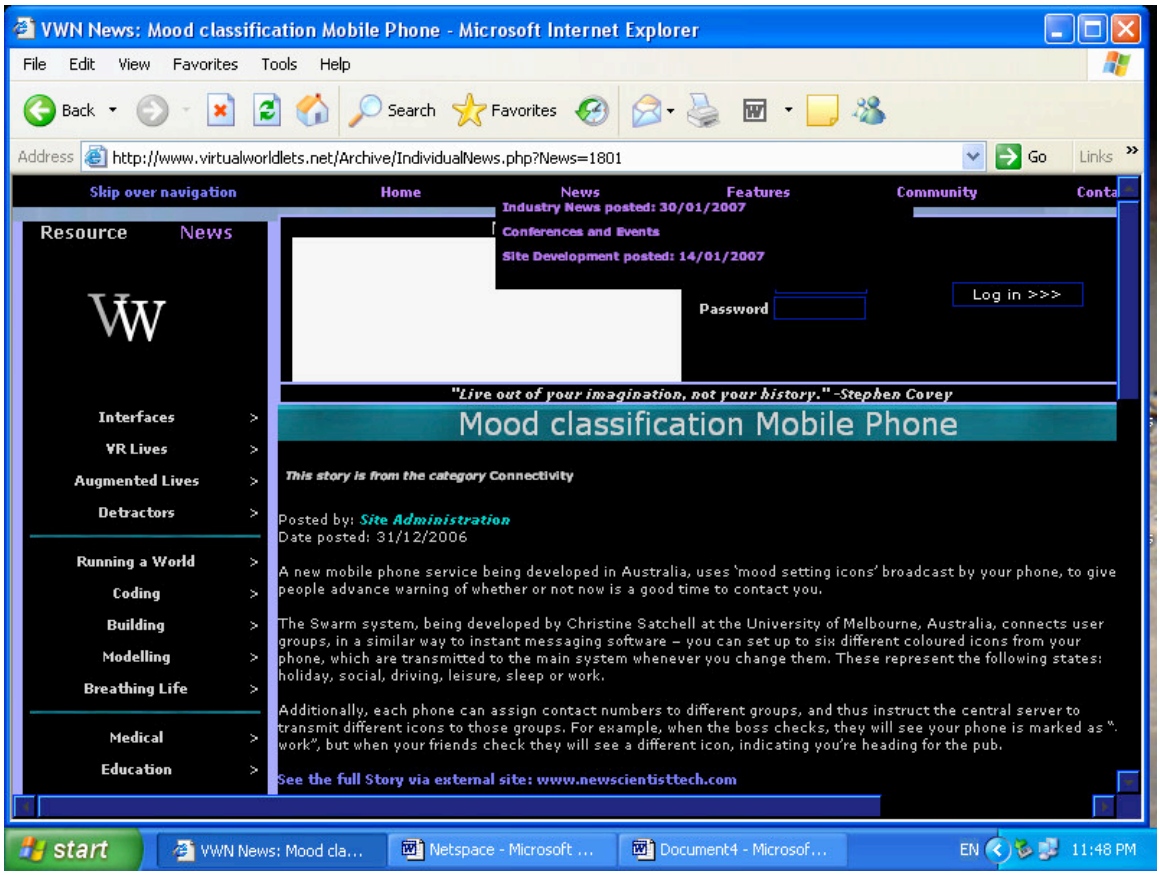
Extract: Swarm enables people to put contacts in different groups, such as "work" or "friend", allowing different information to be given to each.

Site: Virtual Worlds.

Title: Mood Classification for Mobile Phones

URL: http://www.virtualworldlets.net/Archive/IndividualNews.php?News=1801

Date Accessed: Feb 19th, 2007



Extract: A new mobile phone service being developed in Australia, uses 'mood setting icons' broadcast by your phone, to give people advance warning of whether or not now is a good time to contact you.

The process of analyzing the web sites, blogs and discussion threads reveals a common theme, best encapsulated by Yahoo India's banner, "A cell phone system that shows you are at work while being at a party." It would seem that at a time when the convergence of mobile technologies, intelligent environments and ubiquitous computing is heightening a culture of surveillance, The Swarm is being embraced as an almost subversive technology because it can allow users to control and manipulate their digital presence, what information they are revealing about themselves and to whom. This suggests that we now have a 'synthetic world' where we can redefine ourselves and our ability to control what our digital identity is revealing about us is vitally important.

10.4 Future Research

The mobile phone is integral to young peoples' formation of friendship networks, the sharing of their experiences and finally, the identification of their roles within their social worlds. The mobile phone is becoming the preferred way for young people to stay connected with each other. Real life social networks have gone digital, or more specifically, require a digital component to flourish. In this sense, the virtual world seemingly controls the real world, but at the same time is merely an extension of it. It is evident the mobile phone brings with it more than communication; it brings powerful notions of personalization and identity. Significantly, the mobile phone is rapidly changing, converging with a wide range of services and functionalities. This makes predicting future use difficult and problemitises attempts to anticipate how different people will use it in different settings. Yet, as the highly personalized and nuanced nature of mobile phone facilitated interactions integrates with functionalities including the uber-resources provided by the Internet, more research is needed to investigate and understand the rapidly evolving culture of mobile use.

Although we cannot predict future use we can however, theorize about design directions and approaches and through the use of critical methods break down the hierarchy between user and designer. This encourages us to look towards the users themselves for inspiration. With their characteristic obsession with their mobile phones, this shift to encompass user driven design should lead to valuable insights into the future design directions of mobile technologies. Clear user problems and at times even design solutions should emerge, and ideally, lead to designs that are accessible, philosophically grounded and malleable enough to be transformed to meet the needs of each individual.

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APPENDIXES

APPENDIX A: THE INTERVIEW GUIDE

The initial interview guide was designed to gain a broad understanding of how the participants engaged with new digital technologies. It started off with basic questions that related to the following areas:

- Frequency of use.
- Reasons for using technologies.
- Range of technologies used.
- Importance of technology to day-to-day life.
- Difference in use between mobile and landlines.
- Importance of the aesthetics of the mobile phone.

More specific questions were then introduced that covered the following areas:

- The Internet
- Access
- Location of access
- Type of use:
- Communication (e-mail, chat, et cetera)
- Gaming
- Surfing the web
- News groups
- Online publishing
- Mobile phones

Frequency of use:

- Communication (voice or text)
- Message bank
- Screening calls
- Games
- Calendar
- Calculator
- Address book
- WAP
- Bluetooth
- Camera
- Video

Virtual communities:

- Participation in virtual communities.
- Perceived benefits and drawbacks

Type of virtual communities:

- Gaming
- Fan based or special interest
- MUD (multi user dungeon)

The next series of questions looked at issues that might not have been generated by the original questions:

- Customization
- Using technology as intended or not as intended.
- Content production
- Ideal future technology

- Empowering or disenfranchising aspects of technology.
- Privacy
- Security

APPENDIX B. REDUCED MATRIX OF EMERGING THEMES FROM THE YOUNG PEOPLE STUDY

Meta-Theme One: Emerging Archetype of User – The Nomad A distinct archetype of user emerged. The nomad was characterized by a fragmented, spontaneous lifestyle, hence this user group has been given the name 'nomad'. Another distinguishes feature is that the nomad is an 'iconic' user, an 'updater' and at times, a 'resistant user.		
Emerging Theme	*Explanation of Theme*	*Users*
The Nomad	Disconnected Physically Connected Digitally	26
Iconic	Whether it be in celebration or rejection of its form, the mobile has become an artifact for the expression of taste for every user in the study.	35
Resistant	While 33 users expressed affection, attachment, and identification with their mobile phones, this did not translate into an unqualified embrace of a lifestyle generated by mobile technology. In fact, 27 users said that they hate their phones and are resistant to their use.	27
Updater	Mobile phone ownership goes hand in hand with a need to regularly update others of their actions.	26
Meta-Theme Two: Spontaneous Formation of Social Networks The use of mobile phones in the formation of fluid social interaction has accelerated urban mobility.		
Emerging Theme	*Explanation of Theme*	*Users*
Mobile facilitated fluid interaction (swarming)	Mobile phones provide a fluidity and spontaneity of interaction through access to a digital, networked, social world.	27
Blurring the boundaries between real and virtual interaction	There is the sense that they are always connected with each other. With this comes the ability to switch seamlessly between real and virtual environments.	22

Interaction only occurs in the context of regular face-to-face contact	The high level of comfort users experience moving between the virtual and real world of mobile facilitated interaction exists only in the context of pre-made, real life friendships.	22
Scheduling – as an activity in itself (the approximeeting)	The nature of mobile technology is such that it lends immediacy to the formation of social networks, and the outcome of this, is that the act of scheduling itself becomes an important and pleasurable activity. So rather than just meeting a friend, the physical meeting is anticipated with a series of text messages and mobile phone calls.	18
Maintaining virtual presence	Users in the study who report that there were times when they were so regularly exchanging scheduling orientated text messages, that they were providing a continual update of their day- to day activities.	26
Meta-Theme Three: Control: Maintaining Boundaries of Virtual Spaces Mobile phones provide for users a sense of reassurance that connectivity gives. With this comes the consequence of vulnerability against which people try to protect themselves – this creates the seemingly contradictory dynamic of openness vs. isolation. Essentially, this results in the mobile phone creating a generation of conflicted users trying to balance the need for connectivity with the desire to be at times, un-contactable.		
Emerging Theme	*Explanation of Theme*	*Users*
Connectivity vs. contactability	This indicates that users want to be able to use mobile phones to maintain a subtle, disembodied, presence in each other lives. Users want their connectivity tempered by a buffer, or protective zone that mediates the need for commitment to real time interaction.	26
Conveying meaning without communicating	Even when a phone call is not answered the status of the phone itself reveals a lot about the current availability of the user.	24
Meta-theme Four: Identity Users want to use technology to create certain types of identity that have specific characteristics that satisfy psychological needs and desires. This indicates that creating a digital identity is not only about how much information can be restricted but also rather what is revealed.		
Emerging Theme	*Explanation of Theme*	*Users*
Ideal digital self	For 24 users in the study interpreting or reading other peoples' digital identities provided a means of	24

	identifying what the other person was like	
Choice of technology an expression of identity	Different modes of technological communication are not just to facilitate different activities; their choice of the technology is an expression of their identity. Furthermore, because identity is mutiplicitous and shifting rather than singular and static, the way in which the users want to express themselves relates to the context of the exchange, the environment they are in and the nature of the relationship with the person they are communicating with.	24
'Connectivity' as a Defining Concept of Youth Culture	The social dynamic resulting from mobile phone use has driven and redefined the notion of identity. From the user study it can be concluded that 'connectivity' itself has become a defining part of what it is to have a social identity. An extension of this is that users place a great deal of importance on constructing their own digital representations	26
Meta-theme Five: Content Production as Social Communication Mobile phone ownership goes hand in hand with a need to regularly update others of their actions - to document and circulate their experiences.		
Emerging Theme	*Explanation of Theme*	*Users*
Producing and sharing content is an important part of how young people share experiences	When members of a social group cannot be together physically, circulating digitized accounts of an activity becomes an authentic way to share the experience.	26
Content is sentimental	Once sent, the message often has value for the receiver	16
'Cut and paste' multi-media content as social communication	In order to create more dynamic digital identities users reported that they are using a 'cut and paste' approach to communicate through content.	7
Maintaining control of the privacy of content	Users in the study explicitly stated that it is content that they have produced themselves that is the most important to protect in terms of privacy.	17
Wrapping the message in content (digital tokens)	Users in the study were using content as a form of social communication by embedding a picture in the bottom of every e-mail instead of a signature. Furthermore, users in the studies indicate a desire for this paradigm to be turned around – so that the dominant part of the message is the picture itself embedded with the social message.	5

Content production across channels	The user study proved to be helpful in indicating how users are taking advantage of the best of both channels to combine mobile and Internet technologies to create, circulate, distribute and archive content. Users in the study reported that their ability to share experiences that they have produced themselves via text, images and sound bytes is limited by technical problems such as the incompatibility of handsets.	7

APPENDIX C. SELECTED PUBLICATIONS

Satchell, C. (2003). The Swarm: Facilitating fluidity and control in young peoples' use of mobile phones. *Proceedings of OzCHI 2003: New directions in interaction, information environments, media and technology*. Brisbane, Australia. November, 2003.

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