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Exploratory Research Methods For The Extremely Mobile: Supporting Community Interaction Amongst Backpackers

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Title:

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ABSTRACT

Mobile communities of backpackers represent a challenging population to study because of frequent and long-duration of movement, distributed group structure, and adventuresome activities. Five types of mobile group studies are presented here, which address challenges posed by this context to existing methods. Methods used include: contextual interviews, site surveys, participatory activities, field trips, team ethnography, contextual questionnaires, and electronic diary methods. The structure of each method is described, reflected upon and recommendations are made for its effective use.

Many existing mobile and CSCW methods have difficulties when applied to mobile groups, and many are not designed for exploratory research dealing with product conceptualization or requirements analysis. We propose that improvising with a diverse set of available methods is appropriate for many mobile research situations. It may also be advantageous to use multiple methods which explore different aspects of target user groups' behaviour from a variety of perspectives. Furthermore, piloting studies to test methods with new user groups or situations, and using in-situ methods is advisable.

1. INTRODUCTION

Determining requirements and developing technologies in extreme situations can pose challenges not common in other development scenarios. CSCW has traditionally focused on office work in reasonably stable environments which easily support many observation methods. As computer technologies become more mobile and ubiquitous, there is a corresponding interest among researchers to conduct studies in less stable environments. Interacting with user groups can become difficult due to user characteristics (Crabtree et al., 2003), behaviour or activities (Carter et al., 2004; Esbjörnsson et al., 2004), social issues (Strub, 1997), extreme environments (Weilenmann, 2001b) and other reasons. In these challenging circumstances, traditional and widely used research methods may need to be adapted (Millen, 2000; Weilenmann, 2001a).

Emerging areas with challenging characteristics include mobile computing, mobile social software (MoSoSo), and mobile gaming, among many others. These mobile design situations are placing new demands on software development methods. Social scientists have long dealt with conducting research in extremely challenging situations, and advise the use of customized and little-used methods where appropriate (Lofland and Lofland, 1995). Thus it is not surprising to find that alternative methods such as diary studies, Experience Sampling Methodology (ESM) and technology or cultural probes have been successfully used in more challenging software engineering settings (Crabtree et al., 2003; Palen and Salzman, 2002; Scollon et al., 2003).

Mobile group interaction often entails complex situations and behaviour which pose difficulties for existing methods. This area holds opportunities for methodological adaptation and invention (Palen and Salzman, 2002; Weilenmann, 2001a). We are investigating communication behaviour and technology usage by backpackers travelling in Australia, with an aim to experiment with novel methods as needed and produce an electronic travel assistant.

A short overview of backpackers is provided, followed by a review of research using methods applicable to those used in our research. This is followed by a detailed review of the methods used in five studies we have conducted, reflection on how the methods worked in practice, and recommendations for future use. The discussion and conclusion covers how methods can be used most effectively for mobile groups, a framework for selecting multiple methods and the utility of in-situ methods.

2. BACKPACKERS

Backpackers have been described as "travellers who exhibit a preference for budget accommodation; an emphasis on meeting other people (locals and travellers); an independently organized and flexible travel schedule; longer rather than brief holidays; and an emphasis on informal and participatory recreation activities." (Loker-Murphy and Pearce, 1995, p. 830-831). Tourism Queensland estimates that backpackers represent 10% of all visitors to Australia and that this is increasing . Backpacking may be part of a larger trend towards 'restless mobility' of societies (Richards and Wilson, 2004). Thus, studying backpackers' choice of a mobile lifestyle may provide insight into design issues which will shortly be relevant for greater portions of society.

Backpackers are part of the larger tourism market which also includes, for example, package tourists, food and wine tourists, and family holidays. There has been a modest amount of sociological research on backpackers which provides insights into usage situations and social norms of backpackers. One Australian study discusses the duration of travel, lifestyle, goals and movement patterns (Loker-Murphy and Pearce, 1995), and a recent book discusses international differences and backpacker culture (Richards and Wilson, 2004).

Backpackers represent a challenging user group to design with, for a variety of reasons. They are a distributed community where individuals or small groups move frequently and for long duration, but also pause occasionally to work or enjoy particular locations. They often do adventurous activities and use mobile technologies in demanding environments. Backpackers represent a wide range of nationalities, and exchange information in an ad-hoc manner as they move. Many of them never meet each other although they share common needs, such as finding inexpensive transport or accommodation where collaboration could be useful. Methodological challenges raised by designing for/with backpackers include: the need to study people who are travelling long distances, analysis of large distributed group interactions, and determination of technologies that are compatible with a distinct type of lifestyle and culture which only insiders understand well.

3. WILD METHODS FOR CHALLENGING SITUATIONS

Traditional methods are being adapted by researchers to study more challenging situations such as those posed by mobile users (Hagen et al., 2005). A review of traditional and recent methods is provided here, to give a historical perspective on the methods used in our studies with backpackers. Advantages and disadvantages of each method are described to show optimal applicability and opportunities for new methods to be developed.

3.1 Questionnaires

Questionnaires are a standard data collection method for many research disciplines. For example, they are commonly used in marketing to gauge consumer opinions about future products or services. Questionnaires make it possible to sample sections of target demographics and enables statistical analysis (Rubin, 1994). They are often completed in private and then returned to the researcher. Questionnaires can be cheap to produce and resulting data is structured, frequently allowing automated analysis (Helander et al., 1997). They

are also relatively easy to distribute via paper or electronic mediums. Electronic questionnaires provide the option of dynamically changing questions based on previous answers or user characteristics.

Despite their strengths, questionnaires suffer from a variety of weaknesses (Conrath et al., 1983; Helander et al., 1997). These include:

- recording participants' intended or perceived behaviour as opposed to actual behaviour,

- difficulty determining how questions are understood by participants,

- cultural differences in understanding and responding to questions,

- incorrectly targeted questions may miss important issues,

- multiple-choice questions are often used that don't allow participants to explain their answers or give contextual information,

- response rates are often low,

- those responding may be self-selecting,

- and questionnaires can be long and tedious to fill out.

For these reasons, questionnaires are both widely used and received with a level of healthy scepticism (Higgins et al., 1985). Questionnaires are not typically associated with mobility studies, except in the modified form of diary studies discussed below, or to rapidly collect data from participants before or after a mobile activity.

3.2 Diary Studies

Diary studies are a longitudinal method which allow self-reporting of specific aspects of behaviour, usually using a small notebook. They were originally used in a variety of applications including early social networks research (Conrath et al., 1983). Diary studies are often capable of operating in environments which would be difficult for an observer because of social or physical reasons. The method also removes most of the observer effect, which can elicit more personal accounts and natural behaviour. Researchers in areas such as sexual health view diaries as the gold standard because they are a contemporaneous assessment method without many of the accuracy problems of retrospective methods (Schroder et al., 2003).

However, there a number of weaknesses to diary studies. A review of the diary study method in the context of a phone communications study (Higgins et al., 1985) revealed that:

- self-recorded diaries typically understate the actual frequency of communication events,

- participants were more likely to record received rather than initiated communications,

- there can be issues of only recording a subset of communications (e.g. work phone calls vs personal calls).

Diary studies have recently been used in a number of mobile device studies. Grinter and Eldridge first applied them to mobile device research. Their study recorded the time, content, location, recipient and other aspects of communication by teenagers (Grinter and Eldridge, 2001, 2003). Ito and Okabe followed this with another diary study of Japanese teenage conversation habits (Ito and Okabe, 2003), a diary study of mobile discussions while on transport (Ito and Okabe, 2005). Around this time another study requested university students to record their actions and various usability measures while engaged in rendezvousing activities (Colbert, 2002).

Modifications to the paper-based format were introduced in a study of mobile phone usage which incorporated voice-mail as the recording medium (Palen and Salzman, 2002). There are other variations on diary studies such as Experiencing Sampling Method (ESM). An ESM-based study of interruption of managers used mobile devices to prompt the participants to fill out a short questionnaire several times a day (Scollon et al., 2003). This does not rely on participant initiation, but still obtains situated feedback from users in a longitudinal fashion. Diary studies have a number of limitations, but they often fit well in challenging mobile usage environments and offer advantages over other methods (Schroder et al., 2003).

3.3 Cultural probes

Cultural probes are a method to gather information relevant for design from settings that present challenges to observational methods. Typically participants are given a variety of objects such as disposable cameras, notebooks, audio recorders, maps, photo albums, or postcards to record aspects of their life and environment. The method was originally developed during a project dealing with designing for the elderly (Gaver et al., 1999) and has primarily been used in domestic settings by its creators. The method was used again while

developing technologies to support former psychiatric patients (Crabtree et al., 2003), who among other challenges tended to be paranoid about being watched. Cultural probes have also been used to understand mediated intimacy (Kjeldskov, Gibbs et al., 2004).

More recently the notion of probe has been widely expanded upon. 'Technology probes' are functional products with open-ended functionality that support invention and record interactions. Technology probes have been used in domestic and workplace settings (Cheverst et al., 2004; Hutchinson et al., 2003). 'Urban probes' have been used to explore design issues and people's perception of the city (Paulos and Jenkins, 2005).

Probes were originally intended to provide thought provoking material from the usage environment, not formal design requirements. "We were after 'inspirational data' with the probes, to stimulate our imaginations rather than define a set of problems." (Gaver et al., 1999, p.25). They were also intended for designing for pleasure as opposed to utility (Gaver et al., 2004). However, methods can be used by different people for different reasons, and it is clear that participants often do talk about difficulties they have, or things they wish they could do. It is likely to be possible to form requirements or analytical resources from this type of data even if it is not complete or representative (Axup and Viller, 2005b; Crabtree et al., 2003). Probes have some similarity to diary studies in that they ask for content chosen and reported by the participant. Probes added new recording technologies and are often less structured, but remain a self-reporting method that can be used for a variety of purposes in a variety of formats.

3.4 Low-Fidelity Prototyping

Prototyping refers to the creation of a pre-production version of a product being produced. Prototypes vary in levels of complexity: from paper drawings (often called mock-ups), to foam models, to partially implemented and interactive systems. These are loosely described as low, medium and high fidelity prototypes, although more detailed taxonomies have been proposed (Snyder, 2003). Low-fidelity prototypes are commonly used in architecture and industrial design, and very selectively in computer science.

A large portion of mobile computer research is technically focused, with emphasis placed on technologies used, network design and implementation issues (Eagle and Pentland, 2005; Mohapatra et al., 2004;

Pospischil et al., 2002). Consequently, mobile device development tends to feature more high fidelity prototypes. These systems are developed at high-cost: both in terms of time, money and effort to produce proof-of-concept systems that run (Cheverst et al., 2000; Kellogg, 2002; Pospischil et al., 2002).

Low-fidelity prototypes are constructed with inexpensive materials such as pens, paper, clay, foam and cardboard. Use of these tools to make physical representations of design ideas is usually a rapid process. Additionally, inexpensive materials and the ease of discarding or modifying ideas encourages creativity and flexibility in early design stages (Ehn and Kyng, 1992; Ranson et al., 1996; Snyder, 2003). Ehn and Kyng used cardboard prototypes of desktop computers to get feedback from users in early stages of hardware and software design (Ehn and Kyng, 1992). Designers using participatory methods have used simple mock-ups of industrial machinery to provide tangible design examples for maintenance staff and explore their use in natural contexts (Brandt, 2005b). To further enable rapid development, prototyping kits have been developed which facilitate designing for and with users (Brandt, 2005a; Snyder, 2003).

There has been limited usage of low-fidelity prototyping amongst mobile device design researchers. Jeff Hawkins, who was a primary designer of the original Palm Pilot, discussed carrying a block of wood in a pocket to experiment with acceptable form factors and weight of PDAs (Kahney, 1999). In a classic paper on mobile prototype usage, researchers gave a 'magic thing' to a person and followed him for two days, recording resulting design ideas (Iacucci et al., 2000). In-situ usage of simple mobile prototypes provided these designers valuable feedback about realistic usage, without building anything electronic. It is however noted by Ehn and Kyng that computers can simulate certain types of interfaces better than non-interactive mediums (Ehn and Kyng, 1992). Accordingly it may be constructive to look at hybrids which allow fast and cheap construction of simple interactive prototypes, such as for designing mobile communication devices (Dearman et al., 2005).

3.5 In-context Methods and Ethnography

Many of the failures of modern software development processes have been linked to poor understanding of requirements, customer characteristics, usage environments, real usage behaviour and other issues related to context of use (Gammack, 2002; Kotonya and Sommerville, 1998; Kujala et al., 2001; Sommerville and Sawyer, 1997). It has been demonstrated that actual usage of technologies in environments as common as

small offices is very complex and greatly affected by social issues (Rouncefield et al., 1995). Such settings are full of details which could prove problematic for software implementations if not understood from the outset of design. Early work in participatory design encouraged in-context hardware and software development (Floyd et al., 1989), and this tradition carries on in modern participatory research (Brandt, 2005a; Sperschneider and Bagger, 2003).

The recent advent of mobile computing focuses design on a context of use which is even more complex and unpredictable than that which exists in more controlled, desktop-based settings. Researchers in the late 1990s responded to this with a general call for more in-context research to be done within the CSCW community. "In considering mobility, we need to examine the activities in which people engage, with others, when they are 'mobile', and how various tools and artefacts, feature in those activities." (Luff and Heath, 1998, p. 309). The limitations of the lab for mobile evaluation were described by Johnson, who said "… the conventional usability laboratory would not be able to adequately simulate such important aspects as the weather and could not easily provide for the wide range of competing activities and demands on users that might arise in a natural setting." (Johnson, 1998). The call for mobile field studies continues to be prevalent (Axup and Viller, 2005b; Brewster, 2002; Kjeldskov and Graham, 2003), despite the continued focus on lab-based testing and development.

3.6 Exploratory Methods and Formative and Summative Evaluation

It is worth defining what we mean by an 'exploratory method' and how it relates to other standard conceptualizations of methods within a development process. In particular we want to discuss methods used early in the development cycle and how they differ from those used later.

'Formative' and 'summative' are common terms used to differentiate between types of evaluation (and inherently the methods used to evaluate). These terms come from educational contexts where testing of students occurred iteratively throughout the instruction process (formative) or at the end of instruction (summative). However, when the terms were introduced into the HCI community they came to take on other connotations. Formative evaluation came to be understood as guiding change and design from within the process (Helander et al., 1997; Preece, 1994). Summative evaluation came to emphasise testing how good a product is after completion (Preece et al., 2002). So in this sense, a research method such as formal usability

testing could be applied formatively at any time during the product development lifecycle. A summative method might be an evaluation of a completed web site to determine conformance to accessibility standards.

However this seems to miss the changing fidelity of artefacts in the design process, from basic conceptualization and pencil sketches to functional interactive prototypes, each of which have different methods and aims associated with their use. Another common distinction is between 'research' and 'design' methods. Research methods are typically described as occurring earlier in the design process and focus on requirements or user analysis. Design methods happen later on and represent the building stage, prior to or concurrent with full development activities (Mayhew, 1999; Preece et al., 2002, p. 182-195). However, many methods, such as scenarios (Binder, 1999), technology probes (Hutchinson et al., 2003), and Wizard of Oz prototyping (Dahlbäck et al., 1993) seek to understand how technologies could be generated to integrate with existing settings. These methods are the grey area between research and design. They incorporate elements of evaluation, research and design concurrently in an effort to obtain user feedback about a potential future. These methods are used during the critical stage of determining initial product concepts, which greatly affect the nature of the resulting product. It is also very unclear exactly what 'design' encompasses, and how design research fits into this design/research dichotomy. Consequently it may be best to visualize the relationships between these methods in a different way.

It is widely acknowledged that methods and corresponding goals change based on the stage of development in which they are used (Mayhew, 1999). This development model is often depicted by a spiral representation showing increasing design fidelity (Boehm, 1988) and its cyclical nature is often noted. Despite its spiral and cyclical nature, we have depicted our diagram as a straight line to make it easier to understand (see Figure 1). It is usually advised that methods used earlier should be less structured, flexible, qualitative and explorative (Landay and Myers, 1995; Lin et al., 2000; Rubin, 1994, p. 30-46) Some definitions of formative evaluation are in agreement with this; they emphasise the need to generate new design concepts, select promising ideas and rapidly investigate concepts. This contrasts with methods used later which emphasize evaluating existing design concepts, testing if ideas are good and being more structured.

[Insert Figure 1]

Methods used early tend to be more 'explorative'. As Rubin explains "The main objective of the exploratory test is to evaluate (although evaluate is too judgmental a term at this stage, examine or explore is a more accurate term) the effectiveness of preliminary design concepts..." (Rubin, 1994, p. 31). These methods are used during activities such as requirements analysis, product conceptualization (ideation), and early prototype creation. Methods used later are more 'evaluative' in that they review existing concepts instead of generating them. They involve activities such as formal usability testing, expert review and guidelines reviews. This brings to light some of the confusion in calling something a formative or summative 'evaluation'. When products are first being conceptualized the evaluation happens in a less structured fashion and possibly not at all. As a result, it appears that formative methods can be considered to exhibit varying levels of *exploratory* and *evaluative* properties on a continuum.

The research presented in this paper is largely explorative and only slightly verges into the territory of evaluating designs. Our aims are ideologically similar to those of Charles Leinbach who spent time with motor home caravans in the US. His team observed and talked with travellers, looking for opportunities for new products (Leinbach, 2002). We argue that an increased focus on exploratory methods in mobile group research is needed and would be of great use to those developing products in this area.

3.7 Studying Mobile Groups

The majority of mobile research has focused on individual usage (for examples see (Beck et al., 2003; Brewster, 2002; Chincholle et al., 2002)) and most group research has focused on low-mobility or static usage situations (for examples see (Erickson et al., 1999; Hudson et al., 2002; Olson and Olson, 2000)). Emphasis on these individual foci misses the convergence of mobility and group interaction which is increasingly a factor in mobile device design (Pinelle and Gutwin, 2003; Weilenmann, 2003). In the following sections, the collective use of mobile phones is introduced, followed by a taxonomy of studies using different methods to understand mobile group usage. The types of structures for the group studies reviewed are: a) one perspective, b) multiple perspectives in one location, and c) multiple perspectives in multiple locations.

3.7.1 Collective Use of Mobiles

Many features of ubiquitous mobile devices such as SMS, voice calling, and address books are primarily designed for use by a single person. A number of recent studies stand in contrast to this view of solitary usage and one-to-one communications. Studies of rendezvousing have shown multiple parties within groups coordinating their actions (Colbert, 2002, 2005). A study of Swedish teens found varied examples of sharing. These include calling one person's phone to talk to another person in the group, referring to the group state during remote conversation (or vice-versa), borrowing and lending, sharing visual and audio communications and turn-taking (Weilenmann and Larsson, 2002). Investigations of electronic guides have shown people sharing devices and requesting output methods that permit monitoring by multiple users (Woodruff et al., 2001). Other studies have shown that remote people in the user's social network dramatically affect device usage and user behaviour (Gant and Kiesler, 2002). It seems clear that mobile device research should be focusing on social networks of users and how they interact when using technologies; however there has been little work done with this specific focus.

[Insert Figure 2]

3.7.2 One Perspective

Some studies of mobile group usage use the perspective of a single member to understand the entire group (see Figure 2 a). For example, the above-mentioned rendezvousing study used diaries from individuals which concerned how they felt during various stages of group interaction (Colbert, 2005). Similarly, a study of 17 mobile workers observed and interviewed each individual participant, but not others that took part in group actions. The same structure was used in a study of mobile context which followed individual people interacting with remote others (Tamminen et al., 2004). A study of a small group of push-to-talk users watched individual users interacting within the group, but did not record collective group communication or observe the entire group simultaneously (Woodruff and Aoki, 2003, 2004). Practical issues of groups moving apart often thwarts collective observation (Carter et al., 2004) as in the case of ethnographic observation of a bird-hunting group travelling in formation (Harr, 2002).

3.7.3 Multiple Perspectives In One Location

Very few studies of mobile groups have examined multiple perspectives within groups or collective group interaction. Traditional ethnographic methods often enable observation of an entire group if they are collocated (see Figure 2 b). Some research has been done in this manner with mobile prototypes, such as a study observing a group's usage of mobile proximity detectors to maintain awareness of the location of friends skiing together (Weilenmann, 2001b). This study was able to observe simultaneous group usage in some situations. Several studies of mobile phone use by teenagers on public transport has demonstrated simultaneous observation of all group members and an understanding of resulting interactions (Ito and Okabe, 2003; Weilenmann and Larsson, 2002). Another study observed individual teenage mobile users who were sometimes physically proximate to their friends (Berg et al., 2003). This study also recorded photos and notes of remote transmissions, providing some understanding of remote group members' interaction. Kaasinen reports on seven mobile device studies which used a variety of approaches from watching individual users to observing collocated groups and contextual focus groups (Kaasinen, 2005).

3.7.4 Multiple Perspectives In Multiple Locations

Studies of simultaneous usage by mobile groups is methodologically challenging, and particularly so when they are distributed (see Figure 2 c) (Weilenmann, 2001a). One study accomplishing this examined proximity awareness devices used to exchange information by a group of three motorcyclists (Esbjörnsson et al., 2004). Data was logged from the interactions and all participants were interviewed separately and simultaneously after device usage. Similarly, research into the use of a portable audio space (walkie-talkies) recorded the communications of larger groups of users at a music concert (Strub, 1997). This allowed development of a detailed understanding of how different members of the group perceived interaction and affected one another. Likewise, another field study observed a group of three people searching and rendezvousing while using a prototype discussion list (Axup et al., 2005). Three experimenters simultaneously observed participants, all group communications were recorded, and group discussions were conducted following the activity to understand group interaction and group awareness. We have also conducted two studies using team ethnography and audio devices to record conversations of distributed groups of backpackers on a tourist activity (See Section 4.3). Multiple-perspective distributed methods, provide the opportunity to understand

collective behaviour, group identity and normative development resulting from technologically-mediated interactions of distributed people. However, they can require a large group of researchers, expensive recording technologies, and complex and time-consuming data integration and analysis.

3.7.5 Situations of Mobile Groups

Mobility changes the environment in which the group communicates and commonly introduces the challenge of physical distribution during interaction (Weilenmann, 2001a). Distribution means that different environmental factors may affect different group members in different ways, often without the knowledge of other members. Some research has called the environment of mobile technology users 'mobile context' (Tamminen et al., 2004). However, it is unclear what is *not* mobile context when most people regularly move to some degree. It is also unclear in this definition as to whether the person or their environment (e.g. a bus or train) is moving and how context-aggregations can be conceptualised. Accordingly, it may be more productive to look at the degree of change in the environment on a spectrum from static to highly dynamic, and encourage multiple context descriptions.

Information in the environment is, practically speaking, infinite, and users constantly create context based on their interaction with the world and others (Chalmers, 2004; Greenberg, 2001). Relevant context therefore needs to be determined on a case-by-case basis. Ethnographic methods are good at providing rich accounts of context; however they can produce large data sets and a level of detail which can be impractical to analyse or communicate in a timely manner (Millen, 2000). Methods are still needed to select critical situations from amongst larger data sets and provide sufficient resolution of contextual details for those issues.

4. METHODS USED FOR STUDYING BACKPACKERS

Over the course of two years we have conducted five types of studies in conjunction with backpacker hostels and other tourism operators. Methods used in other settings have been adapted in ways that seemed appropriate, or became necessary while studying backpackers. First we explain how different methods were initially chosen to suit the constraints of various aspects of the culture we wanted to understand. Then, for each study, we explain the structure and analysis techniques, followed by reflection on usage of the method

and a summary of recommendations. The focus of this paper is on methods; results of the studies themselves will be covered elsewhere.

4.1 Multiple Methods For Different Aspects of the Research Situation

Research methods have different strengths and it may take multiple methods to gain a good understanding of different critical factors (Mackay and Fayard, 1997). Two factors that are important for backpackers are 1) group structure and 2) duration of interaction. Some research methods work better for collocated or distributed groups (Weilenmann, 2001a); others work rapidly or observe subjects for long periods of time (Millen, 2000). Accordingly, the methods chosen for the studies presented here were structured to explore combinations of the variables of 'group structure' and 'duration of interaction' (see Figure 3).

[Insert Figure 3]

Short-term collocated groups (A) were studied using contextual interviews and participatory activities; longer-term collocated groups (B) were addressed with field trips and team ethnography; short-term distributed networks (C) of backpackers were queried using contextual questionnaires; long-term distributed networks (D) required electronic diary studies. Each method explores different aspects of the backpacker lifestyle and consults with users from different perspectives.

4.2 Contextual Interviews and Site Surveys

4.2.1 Structure and Analysis Techniques

Contextual interviews with 24 backpackers (some of whom travelled in pairs) were held at two hostels (Hostels A and B) in Brisbane, Australia. Hostel A is a moderate size (143 beds) and in a suburb of town just outside the city centre which has a reputation for alternative culture and lifestyles. Hostel B is a much larger hostel (380 beds) with a high turnover rate, located in the city centre. Interviews were semi-structured and held in public areas within the hostels such as kitchens, lounges or porches. Hostel owners were initially contacted by phone to determine interest in supporting the research. The researchers met with the managers in person and set up times to return to conduct interviews.

In Hostel A, one of the authors handed out flyers in the morning and did interviews on a porch outside the communal kitchen and TV room. Backpackers were invited to discuss the backpacker community, communication patterns, travelling habits, travel gear, and recording and sharing of travel experiences in a loosely structured format. Backpackers were approached in-person and interviews were conducted steadily throughout the day. Notes were taken directly at the time of interview on a small laptop and audio was recorded on a portable MP3 player. We were interested in what technologies backpackers used to support their activities. Accordingly, we asked several backpackers if they wished to share the contents of their backpacks with the researcher as a way to discuss travel technologies. This attempt failed for reasons discussed in the reflection section below.

[Place Figure 4]

In Hostel B, flyers were handed out directly to backpackers which usually led immediately to an interview in the same format as above. A short participatory activity was also conducted with three participants, which used a 'social network board' with a circular graph layout to elicit social tie information (see Figure 4). The graph is drawn on a sheet of foam-core and uses sticky-notes to show relationships between items. Three types of graphs were suggested to participants which included: frequency of communication, emotional bond and physical distance. For each type of graph, participants were asked to position ten smaller sticky notes on the graph which contained items such as: friends met while travelling, family, and friends at home. Participants were also invited to create their own social groups or types of graphs. Pictures were taken of each completed graph and then the board and notes were re-used.

Tours of five hostels were conducted and recorded with photographs. The photos represent a fairly typical hostel environment in which many backpackers spend a significant amount of time in. They show locations where communal activities happen and services which are offered to residents. Special effort was made to locate message boards inside or outside the hostels and take photos of postings on them. This was due to our interest in building an information sharing system and desire to review existing methods backpackers' used.

[Place Figure 5]

Audio recordings of the interviews were reviewed later for quotes and additional detail, but were not fully transcribed. In most cases the hostel environment was reasonably quiet and recordings were of sufficient

quality. Pictures of the social network boards were reviewed for common trends. Pictures of the hostel were primarily used to communicate the environment in reports as the first author has backpacked before and is very familiar with the hostel setting. Photos of the message board postings were cleaned up in a graphics program to enhance legibility (see Figure 5). A detailed spreadsheet recorded the message content, intention for posting, physical location, hostel, city, picture filename and whether it was posted by a backpacker or a local resident. A review of this data resulted in the identification of a number of trends, an understanding of common purposes for posting notices and frequencies thereof.

4.2.2 Reflection on usage

Interviews occurred over six days throughout a period of several months. Hostel A was smaller and partially caters to itinerant workers and 'long-termers' in addition to more traditional backpackers. Finding participants to talk to was sometimes challenging and the interviewer spent some periods sitting and waiting by himself. The long-termers regularly sat outside talking and many were not interested in being interviewed. One declined to give his name for legal reasons and others were simply not interested. We stopped doing interviews at this location so as not to bother some of these backpackers. In contrast, Hostel B was a large, high-traffic hostel with short-term backpackers. It was much easier to find backpackers to interview there and the chance of seeing the same backpacker twice was minimal. At this location backpackers were often just checking in or waiting for transport to arrive and often had short periods of time available. We discovered that arriving just before or after the Oz Experience Bus (a backpacker bus line) arrived was a good time to find participants. There was also a rooftop sunbathing area where backpackers were often available and willing to talk. Occasionally the researcher had to follow participants to an activity (e.g. going out for lunch) to conduct the interview.

[Place Figure 6]

At hostel A we asked backpackers to show us the contents of their backpacks to investigate travel technologies. However, they disliked this idea and it may have violated their privacy or simply been too arduous to get the bag from their rooms. Consequently we stopped making this request. No incentives were offered and backpackers didn't have advance notice that this would be asked of them.

The social network board worked well. It was intuitively understood by participants and offered a tangible way to show social ties. It also worked well on hostel tables or floors (see Figure 6). However, it rapidly showed us how much social ties depended on location and circumstances, and were fundamentally dynamic. This indicated we should not be evaluating them at only one place and time (as we were doing), so we stopped using it.

Part of our methodology included documenting backpackers' environment, but hostels are not always comfortable with photographs being taken. Sometimes we had to find staff to show us around and selectively ask to take pictures. Finding notice boards was sometimes difficult due to the maze-like structures of some hostels; however, the resulting photos were very useful.

The data collection methods were not intended to be used in a quantitative manner or allow statistical analysis. Doing small numbers of interviews or activities with participants in different locations, spread over a broader time, allowed gradual adaptation of the methods as needed. Many of the conversations and photos elicited product requirements as well as a rich understanding of the environment where backpackers use mobile technologies. Methods such as the social network board were more interesting for the discussions they prompted than the actual data they contained. The variety of methods allowed different perspectives on backpacker behaviour, both from self-reported accounts and what was observed by the researchers.

4.2.3 Recommendations

Based on our experiences using interviews and site surveys, we offer the following advice for others using them to study mobile groups:

- **Make contact with authorities in the desired location if they exist.** It is often required for ethical reasons, but they can often provide support and give inside information about effective research strategies.

- **Try new method ideas quickly and cheaply.** It is difficult to predict whether methods will work and failures can produce interesting results. So it is best to try them out if they seem plausible.

- **Be aware of methods that violate social norms.** Spending time in the environment observing or doing interviews often provides insight into what methods are socially appropriate.

- **Maintain a positive environment for future research.** Be aware of bothering participants or authorities in the research environment. Attempt to find ways to interest participants, reward them or cycle participants.

- **Look for opportunities to introduce tangible objects to facilitate discussion.** Discussion of abstract future technologies and hypothetical situations is difficult. Find ways to tangibly represent these ideas to make it easier for both researchers and participants to find common representations and language.

4.3 Field Trips and Mobile Information Sharing (MIS) Studies

4.3.1 Structure and Analysis Techniques

A series of studies were run investigating mobile information sharing and social network formation amongst backpackers engaged in a typical tourist activity. Both studies are named 'Mobile Information Sharing' (MIS) with iterations 1 and 2. A group of first six, and then seven backpackers were recruited from 'Hostel B' in Brisbane, Australia for each study. They participated in a day-long 'field trip' which included walking through the city, a boat cruise, and an animal park visit. Thus it consisted of three distinct types of mobility: 1) walking to a destination, 2) using group transportation, 3) walking around a location.

While signing up participants, hostel staff distributed a questionnaire concerning the participants' recent travel history, future travel plans and any travel-related questions they had. No attempt was made to restrict the participant demographic, other than to ensure they were travelling and not long-term residents. Backpackers typically stay two to three nights in Brisbane (Ballen, 2004) and most had arrived just prior to the study. Participants were compensated by receiving the trip for free. Walking in the city, the boat cruise and park visit are inexpensive and common activities for backpackers and other tourists.

In MIS-1 two backpackers who volunteered (three in MIS-2), wore digital audio recorders throughout the day which primarily recorded their own speech and those they talked with. The recorders required no interaction by participants and were not easily recognizable by others. All participants knew audio and video recorders were used, and those carrying audio recorders could turn them off or muffle them if needed for privacy reasons.

In MIS-2, foam mobile prototypes were carried and 'used' by backpackers during the trip. The participants were each asked to choose one mobile device prototype from 12 available options. Each prototype was a piece of lightweight foam with a sticky-note describing a fictional function attached to it. Prototype functions were chosen based on issues observed in the MIS-1 study. For example, one function read "I can tell you what other backpackers thought about something." They were requested to carry their chosen 'magic thing' (Iacucci et al., 2000) with them during the day and look for opportunities to use and modify it (see Figure 9). An experimenter demonstrated marking up a sample prototype with a pen and each participant was given a permanent marker. An experimenter also demonstrated talking into the prototype and showed another experimenter how he was interacting with it.

Both study iterations began at 8:30 am and finished at 5 pm. They began with a questionnaire, then a short description of the study and familiarizing participants with the audio recorders. The questionnaire asked for evaluations of communication frequency, interpersonal bond, relationship durations and trust of travel information between the group members. Index cards with emergency numbers and a schedule for the day were distributed. No other instructions were given about what the backpackers should do during the day.

In MIS-1 two observers accompanied the group, with one taking notes and the other using video. In MIS-2, three observers took notes and digital photographs only. All backpackers were continuously observed, with the exception of cases where a backpacker left by themselves, or practicalities such as bathrooms or eating.

The researchers and backpackers walked from the hostel, through the city centre and shopping mall, to the boat dock. The observers attempted to avoid introducing any new topics or behaviour to the backpacker group, but playing the role of 'tour guide' was unavoidable in some cases (e.g. directions to get to the boat.) Questions were asked to clarify issues or to request elaboration on interesting topics introduced by the backpackers, which is consistent with participant observer protocols (Lofland and Lofland, 1995). The boat cruise lasts approximately 1.5 hours and drops off passengers at the animal park. The backpackers were given their own tickets to the park and were free to do what they wished during their 2 hours there. In MIS-2 a brief meeting was pre-arranged for noon, in which the participants could discuss how they were doing with the prototypes. Participants and observers re-boarded the boat after the park visit, for the return cruise back to Brisbane city. Upon docking they walked approximately the same route back to the hostel. This was followed

by questionnaires, discussion and a participatory design activity run in the hostel by three researchers (see Section 4.4).

Immediately upon returning in MIS-1, the backpackers completed a new questionnaire which used answers from the previous questionnaire, pertaining to future travel locations and questions. They were asked if these topics had been discussed during the day's tourist activity. Video from the day was then used to prompt discussion about information sharing on the trip. Backpackers reflected on what they talked about, group formations throughout the day and general travel issues.

Upon returning in MIS-2, participants were invited to sequentially present their device prototype to the group, explaining how they had used it and any modifications they had made to it. They then filled out the questionnaire but did not engage in the video-review used in MIS-1. We had previously run a pilot of the prototype presentation activity with ten postgraduate HCI students and lecturers in which the protocol for the exercise was refined.

To additionally explore how social networks change over time, backpackers were given a sealed envelope before leaving. It was requested that they wait a week to open it, and then complete and return the enclosed postcard. The postcard asked if group members did activities with each other after the study and whether they contacted each other after leaving Brisbane. This feature of the study was prompted by the failure of the previous social network board (see Section 4.1), which indicated that more data on how social networks change over time was needed.

The study resulted in three recordings of 8.5 hours of audio data. One of these was completely reviewed and the others were selectively reviewed for events of interest. Video from the first study was comprehensively reviewed and primarily used to compose a short video summary of the field trip and provide snapshots of particular situations of interest. MIS-1 resulted in 1805 observations and MIS-2 in 1126. These were tagged by the medium which they came from (video, audio, observation). They were also tagged into one or more of the following categories which emerged during analysis:

- Information exchange (either perceiving environmental information or discussion),
- Meta information (e.g. comments by researcher on research method),

- Problems (experienced or mentioned by backpackers),

- Environment (aspects of physical situation mentioned by or affecting backpackers)

- Tool usage (usage of technologies and objects)

- Activity (physical movement).

Additional tags such as sharing, remote communication, foreign languages, budget, questions, and quotes were also used.

4.3.2 Reflection on usage

The methods we adapted for this study were intended to focus on reasonably natural, in-situ behaviour of a type of mobile group. Consequently we developed the idea of an activity which allowed easily observing backpackers doing a range of typical mobile behaviours. In MIS-1 one of the backpackers mentioned that "this feels like a school field trip", which seemed an apt name. As noted above, a number of small changes were made to the design of the MIS-2 study based on the results of MIS-1. These included the number of observers, recording methods, number of microphones, introduction of prototypes and an in-situ focus group at lunch. Several of these changes addressed problems in MIS-1 and prototypes were introduced to start exploring new types of group behaviour.

[Insert Figure 8]

In the first study the observers avoided introducing new topics. However it became clear that if questions were not posed to backpackers at opportune times, then valuable data would be lost. As a result, in MIS-2 active attempts were made by the researchers to ask about activities the participants were doing, or to elaborate about topics backpackers had briefly introduced. Early in MIS-2 it seemed that the prototypes were being ignored and the observers started to explicitly bring up the topic of "how they were doing with the prototype" to encourage thinking about design possibilities. The participants did think about potential uses for their prototypes and four prototypes had interfaces and functions drawn on them (see Figure 8).

Another challenge was recruiting and collecting participants for the start of the study. In MIS-1 only four participants had previously been signed up and two more backpackers were recruited by an experimenter a few minutes before the study started. In MIS-2 a misunderstanding between an experimenter and hostel staff

resulted in seven backpackers being recruited. This was because two groups of two, and one group of three had signed up, which couldn't form a group of six. The forms had to be redesigned the night before to accommodate an additional participant. Improvements in the study design could help, but we believe unpredictability is an inherent part of group studies. It is useful to design the study structure to be flexible to allow naturally occurring changes to be accommodated.

We started with two observers; one using a video camera. Video was very problematic, both for social and physical reasons. Audio on the video-camera rarely recorded well in noisy, natural environments. Video was also distracting to participants and other tourists. It was also too slow and detailed for post-hoc review of the day's events with backpackers, unlike usage of photographs for this purpose (Axup et al., 2005). In accord with this, video was not used in MIS-2, except in the more controlled environment of the hostel. Digital cameras and notepads worked well, with the exception of difficulty with writing: in the rain, while walking and fast enough to keep up with conversation and events.

Multiple observers worked fine except for cases of there being insufficient observers to cover all three subgroups. Consequently in MIS-2 we upgraded to three observers using only notepads and digital cameras. Three observers were necessary to capture distributed backpacker behaviour which occurred on a number of occasions. This is an example of team ethnography which has worked well in other studies (Axup et al., 2005; Lofland and Lofland, 1995; Weilenmann, 2001a). Audio recordings provided a satisfactory recording of a day's worth of distributed conversations.

We found that video is most useful for watching single people, in quiet environments, where details of movement are critical. Individual digital audio recorders record single participants and often their conversational partner well, depending on how noisy the environment is. First-person observations provide a good understanding of social issues, broader environmental situations and some movement issues. More observers enable multiple perspectives and increased probability of tracking distributed groups. However this increases group size and awkwardness. More audio recorders capture talk and conversation from more individuals, but add significant analysis time. However, they do not add distraction for external parties, such as video cameras cause.

Observer notes necessarily tend to provide summary accounts because of time constraints and limited attention. Summaries can be beneficial for rapid review and provide an index for reviewing audio data with more detail. In conclusion, our research indicates that there is a complementary relationship between digital audio recordings and direct observations, for understanding mobile group behaviour. This echoes other results showing complementary pairing of video and direct observation for low-mobility groups (Ruhleder and Jordan, 1997).

One of the goals of the study was to develop requirements and design ideas based on observed behaviour. A MYSQL database and a PHP-based web interface was used to store and analyse the data from MIS-2. It included all types of study observations and most were tagged with one or more category labels. It became clear after extended review of the data that items with certain tags were more effective at suggesting broad usage requirements and specific design ideas. These tags were: questions, problems, fun, desire, intent and common occurrences. The results of this and the requirements analysis process it implies will be the subject of another paper.

4.3.3 Recommendations

Based on our experiences using field trips, we offer the following advice for others using them to study mobile groups:

- **Use frequent photographs instead of video**, unless minute details of movement or the environment are a major aim of the research. Pictures are easier to review, and still cameras attract less attention in many environments and offer a reasonable level of visual detail.

- **Use multiple audio recorders carried by participants**. They are lightweight and pick up many conversations observers don't hear. In our studies, female participants tended to be more talkative than males, and pre-existing subgroups tended to stick together. Giving one microphone per subgroup and preferably to the more talkative member of each subgroup, may be most effective.

- **Use multiple observers**, particularly if participants are likely to become distributed. Firsthand observations are important to understand the situation and narrative of the activity. They also serve to provide multiple photographic viewpoints.

- **Don't exhaustively take notes**. Most items will be captured in pictures or audio recordings. Note-taking can be difficult while walking or talking with participants, and distracting to participants. Focus on documenting movement and environmental changes not captured easily by other methods.

- **Determine pre-existing social networks** and network members that are not present (e.g. family, friends at home). Watch how social ties form during the study. This effects mobile device usage and future design.

- **Explore mobile prototype use in near-natural settings**. Out in 'the wild' (Hutchins, 1995) we observed that: sound, weather, temperature, environmental objects, people, and the users' personal belongings, emotions and concerns affected how they used foam prototypes. These cannot be adequately predicted or simulated in unnatural settings.

- **Do interventions after observing first**. We did a reasonably naturalistic observation in MIS-1. This enabled us to see what the effects of the prototype introduction were in MIS-2. Additionally, it was the analysis of naturally occurring issues in MIS-1 that informed development of the prototypes for MIS-2. New technologies always change the target environment; it is useful to know how it is changing.

- **Observers should not avoid asking questions**. While we avoided introducing uncharacteristic topics or directing backpacker behaviour, it became clear that asking questions was necessary. There are many opportunities for clarification, further elaboration or discussing topics of interest to the study. These are too valuable to miss by remaining a detached observer.

- **Look for opportunities for mobile digital data entry**. To better facilitate ethnographic observation we recommend development of a mobile digital data logging system with automatic time-stamping and database integration. Mobile text entry systems such as the Frogpad (www.frogpad.com) and Twiddler (www.handykey.com) could be integrated with wearable software and hardware in ways that don't attract unnecessary attention. This is an area for future work.

4.4 Participatory Social Pairing Exercise

4.4.1 Structure and Analysis Techniques

Two iterations of an activity exploring the utility of externally imposed matching systems was conducted in conjunction with the MIS studies (see Section 4.3). The first session had six participants and the second had seven. The backpackers were paired with others in the group who they had a travel affinity with. For example, BP1 (Backpacker 1) had recently been to the Harbour Bridge in Sydney and BP7 intended to climb it., providing a uni-directional social tie. This information had been obtained from questionnaires completed a day or two previously while signing up for the study. The questionnaires requested the last five travel locations/activities, the next five travel locations/activities and up to five travel related questions. Pairings were manually made by one or two researchers while the participants were engaged in the field trip.

The participants were asked to spend roughly five minutes talking to each of the 1-3 people they had been paired with. In the first session no attempt was made to track the outcome of individual discussions. In the second session backpackers filled out a short form after discussing each topic (see Figure 7). The form asked if the topic had been discussed previously during the field trip and how useful the discussion was. One researcher then led a discussion of the utility of the automatic pairings between group members. This was followed by a short discussion about trust of travel information and possible uses for an information sharing system between backpackers. One of the observers in the second session worked for Lonely Planet and additional discussion topics concerning guidebooks were introduced at his request.

4.4.2 Reflection on usage

The first session yielded qualitative responses which were recorded via audio and notes. The second session was similar, but allowed analysis of the forms to determine rough quantitative estimates. This data was reviewed to determine missed opportunities for information exchange, which consisted of information backpackers had indicated they wanted or needed, but which were not discussed. It also allowed analysis of which types of questions received high or low subjective ratings. The audio was very difficult to record as it entailed three simultaneous conversations. In the first session we tried placing audio recorders in a central location, which did not produce usable results. In the second session we left the three recorders on the

participants who had been carrying them during the previous field trip. This produced marginally better results, but some discussions were between people not carrying microphones and there was background street noise and hostel announcements. Audio for the focus group was also poor and we intend to use a larger external microphone in the future.

The process of pairing past locations, future locations and travel questions was more demanding than expected. In both cases it took researchers several hours to make pairings and a high degree of knowledge of local geography and culture was useful. While the experimenters arranged the ties for participants it became apparent that there were three types of possible pairings: Past ⇔ Past, Past ⇨ Future, and Future ⇔ Future. Future ⇔ Future pairings were removed from the second session after performing poorly in the first session. It also became clear that travelling partners had common ties, but should not be paired together as they did not have new information for each other. Furthermore, some people were hubs in the network, which produced situations where some backpackers had many possible pairings, while other had few.

Low group sizes limited the number of possible pairings and a larger study would be useful. However, this would require automation and use of different methods as the number of ties grows rapidly. The short forms were not used in the first exercise, but inability to track backpacker opinions justified their introduction in the second. It is generally better to start with less structure and determine where it should be introduced without constraining feedback. Doing both the pairings and the following discussion in a group format was effective.

The method allowed backpackers to try out a simple prototype social pairing system rapidly, with little expense and without the distraction of functional interface designs. This grounded the following discussion which produced more accurate responses about potential future usage of a similar system. Analysis of the ties and ratings has opened up a new level of understanding of backpacker social pairings and the methods now require modifications to investigate more detailed phenomena in future studies.

4.4.3 Recommendations

Based on our experiences using participatory social pairing exercises, we offer the following advice for others using them to study mobile groups:

- **Experiment with different kinds of pairings.** There are many different ways to pair people and numerous ways to use the pairings. Exploring these in an open research topic.

- **Experiment with different group sizes.** Larger groups facilitate increased likelihood of accurate pairings, but may reduce the level of detail which can be tracked about participants opinions of those pairings.

- **Combine the activity with a focus group following it.** Focus groups are more effective if they first engage the participants in a shared experience of the subject matter in a tangible fashion.

- **Consider combining field studies with group participatory activities** that relate to each other. This will allow participants to draw on real, recent experiences for the participatory workshops.

4.5 Contextual Postcard Questionnaire Study

4.5.1 Structure and Analysis Techniques

We conducted a study intended to canvas a range of Australian cities and determine relevant design issues for a mobile travel assistant. A primary research goal was to determine relevant usage situations and elicit situated design problems backpackers were currently experiencing. Backpackers move frequently and research methods that can be distributed widely and catch participants when they pause are often appropriate.

Short questionnaires with open-ended design questions were printed on 700 postcards (see

Figure 10), which were distributed to seven Australian hostels. Two hostels were in Brisbane, two in Sydney, and one each in Adelaide, Melbourne and Cairns. These hostels were selected from a group of 13 hostels, some of which declined to participate. Hostels were originally contacted by e-mail to determine willingness to participate. Those who responded positively were sent a package of 100 postcards and instructions on how to distribute them. Hostel staff were requested to hand out one postcard to each incoming guest, until all postcards had been used. They were also given a sheet outlining the purpose of the study. Backpackers were requested by staff to fill out the postcard and place it in any post box.

The postcards are roughly business size (21 cm X 10 cm) and were post-paid; meaning that backpackers didn't need to purchase stamps, and the researchers were only charged for returned cards. The front of the

cards contained a description of the study, instructions on using the postcard and contact information for the study organizers (see Figure 10). The reverse side contained seven brief questions and a code indicating the card version and hostel number. Four of the questions were the same on all cards and concerned current city, current place, gender, and travelling alone or in a group. The remaining three questions on each card were designed to elicit free-form feedback. Nine open-ended questions were used in total, with three questions assigned to each of three card versions. The nine questions were evenly distributed at each hostel.

The postcards were designed to be brief and usable to increase response rates. The questions focused on backpackers' situated responses to relevant design issues (see Table 1). It was expected that postcards would be filled out in a variety of locations and that the respondents' context would affect their answers. Consequently, the questions asked backpackers' about present location and what current travel issues were being experienced. The forms were similar to cultural probes (Gaver et al., 1999) in that participants chose which details to divulge to researchers about their personal lives and were completed in a natural travel environment. Returned postcards were photographed and transcribed into a spreadsheet. They were loosely categorized, but seem more successful at suggesting design requirements or conveying aspects of a normal usage environment in an unstructured format.

4.5.2 Reflection on usage

To our surprise, only 15 cards were returned. Due to the low response rate, all seven hostels were contacted with a follow-up e-mail and one respondent who gave contact information was contacted. Of the two hostels that replied, the issues of lack of hostel staff remuneration and generally apathy by backpackers was given. One also admitted to placing the stack of flyers on a counter. The backpacker we contacted indicated that he had never been handed a postcard when he checked in, but had picked it up from a stack sitting in a pile amongst other flyers.

> "Although I do apologise for my awful handwriting. I was extremely hung over that day. I know, tell
> me about it??! It was self-inflicted. Although a friend from Alice Springs arrived in Adelaide and
> regrettably it turned out to be another drunken night. shocking performance!!! :o) Anyway. Back to
> the forms. The forms were just left on the reception desk of the [hostel]. No explanation. They were
> just left with loads of other leaflets. They grabbed my attention mainly because I had studied

Computer Engineering at Birmingham Uni. Here in the UK, and I guess what you are researching does genuinely interest me! I had no problems in filling out the form. Although my inability to write was my major problem :o)"

This account indicates that self-selection may have been an issue and that distribution was a significant problem. It also shows the circumstances in which the cards may have been filled out in. We believe that lack of incentives for hostel staff and lack of face to face interaction with hostel staff and respondents were the primary causes of the low response rate. We are currently working with Lonely Planet to run a larger version of the study in multiple countries using a different delivery and prize system. We are also distributing postcards to backpackers via a travel agent which is producing better return rates so far.

Responses were roughly of two varieties: the jocular response, sometimes provocative and understandably incorporating the study materials into their current holiday-oriented mindset, and the serious response, describing difficulties and concerns. An example of the first is a backpacker in the red light district of Sydney who said "If you can't get a room to yourself, take her in the fire exit." A more serious response came from a backpacker worried about the quality of tours. "Do not sign up for expensive 'tours' w/out investigating public services such as transportation (buses, trains, ferries) and concession prices." Both types of responses seem informative for design as they show emotion, attitudes, problems and needs of the respondents. We are pleased to find that even serious questions didn't hamper some backpackers' effectiveness at giving absurd answers and having fun with the process. Based on initial results, it appears that postcards filled out at the travel agent are more practical and serious than some of those we received from hostels.

4.5.3 Recommendations

Based on our experiences using contextual postcard questionnaires, we offer the following advice for others using them to study mobile groups:

- **Keep the questions simple and open-ended.** Certain topics will be of interest, but it is not designed for statistical analysis. The goal is to encourage unexpected answers, personal bias (by respondents) and ideas which challenge designers' pre-conceptions of the design situation. This contrasts with questionnaire design which often advocates focussed questions (Helander et al., 1997, p. 697). We

agree with Gaver et al, that supporting the unexpected is desirable (Gaver et al., 2004). We also believe that designer intuition should be embraced by probing specific areas of interest, which are more likely to produce useful design material than untargeted questions.

- **Focus questions on the immediate environment or recent situations.** The point is to leverage the fact that they are currently in a situation while filling out the card. This environment is present-at-hand for the participant and the card can ask the participant to share portions of it.

- **Target respondents currently doing the activities you will design for.** Contacting people while they are doing the relevant activity will enable them to remember more aspects of it because it is recent.

- **Consider remuneration**, particularly for those distributing the cards. As with all questionnaires there is a risk of no one filling them out. Leveraging face-to-face distribution systems is likely to increase return rates.

4.6 Paper and Electronic Diary Studies

4.6.1 Structure and Analysis Techniques

Initially a study design was chosen that is similar to traditional diary studies. One backpacker travelling alone, and a pair of backpackers travelling together, were each given a paper journal to record their travels and those they met. They were given pre-stamped envelopes to return the journals with. The backpackers were selected from those who took part in the contextual interviews and appeared responsible and interested. One diary was used to form a social network diagram showing people, location and activities. It was also used to develop a physical context chart depicting her travel route.

A separate study reviewed travel web logs (blogs) which recorded pictures and narrative accounts of backpackers travelling over long periods (up to several years.) Several traditional blogs used to document travel were reviewed, as well as the online travel diaries from 373 backpackers (getjealous.com). 4677 photos documenting travel experiences have been reviewed for usage situations and group activities. The data is also being used to create social network diagrams and automated generation of vignettes. As a proof of concept, the diaries of two backpackers have been used to develop animated social network diagrams showing the growth or withering of social ties by backpackers as they move. Other diagrams show summary views of

backpacker social networks after a period of travel (see Figure 11), the relationship between people met and activities engaged in, and different levels of physical context over time. We are also exploring the relationships between location and social ties, and movement of information within ad-hoc groups. This study is still in progress.

4.6.2 Reflection on usage

The structure of a diary study requires a dedicated participant to regularly record events over a longer period of time, and then return the diary to a researcher (Higgins et al., 1985). Backpackers move a great deal and are usually young and on vacation. We discovered these traits are not necessarily conducive to traditional diary studies. We worked with two participants. One kept a journal for three weeks, but recorded short, infrequent entries. This data was sufficient to begin designing diagrams with, but not as rich as we had hoped. A second couple travelling together was given another journal. Despite several reassuring e-mail responses and three months waiting, it was never returned.

As a result, we began looking for other ways backpackers had already recorded their travel experiences so that waiting for them to complete a diary would not be necessary. Travel blogs (e.g. travelpod.com) do exactly this and supplement it with pictures and other contextual information (see Figure 12). Research using this data could be considered an 'electronic diary study'. Using blog data has the advantage of allowing participants to be chosen after they have demonstrated how reliably they record their travels, and bloggers are used to their data being publicly available. Blogs offer in-situ discussion of events as they happen, in the context of a larger pattern of extended movement. Coding blog data for people, places, and other variables is time consuming, although we are exploring ways of automating portions of this.

4.6.3 Recommendations

Based on our experiences using paper and electronic diary studies, we offer the following advice for others using them to study mobile groups:

- **Find reliable participants.** This is not as easy as it sounds. Remuneration may help and taking steps to simplify the recording and return delivery should be taken. Plan for the possibility of a low return rate.

- **Do not run the study for long periods.** This increases risk. It becomes apparent sooner if the method will work if the study is short.

- **Consider semi-structured diary layouts.** It may be easier for participants to fill out diaries that offer a set format or checklists of items. This should be balanced with the desire to avoid biasing data.

- **Look for other data sources that are already completed.** It saves a great deal of time to find other types of data which can be adapted for the aims of the research. It is increasingly possible to find online sources of diary data which log mobile group experiences.

5. DISCUSSION

Finding appropriate research methods for challenging situations is difficult because standard methods were often developed for, or had evolved from, different situations than those being studied. Strategies for selecting and adapting traditional methods are provided below, along with a discussion of the utility of in-situ methods.

5.1 Applicability of Mobile and CSCW Methods for Mobile Groups

Many research methods are not well suited for studying either mobility or group activity. New mobile methods are being developed which allow observation of moving users and some aspects of context which may affect their behaviour. Many of these methods, such as mobile usability testing (Brewster, 2002; Kjeldskov, Skov et al., 2004) are evaluative in nature, focusing on testing existing designs and primarily quantitative measurement. Relatively few mobile studies have looked at exploratory methods involved in product conceptualization, requirements analysis or early prototype usage (Harr, 2002; Weilenmann, 2001b).

CSCW typically uses methods applicable to stable collocated users, although some groupware systems analyze stable distributed users (Erickson and Kellogg, 2002; Leinonen et al., 2005; Weilenmann, 2001a). These methods often focus on different aspects of the environment and behaviour than are relevant for mobility studies. An exception to this is a study of workplace relations which examined how local mobility affected work (Bellotti and Bly, 1996). However, they like most other CSCW research, primarily concentrate on *work*, which only has partial utility when designing for *fun*. Accordingly, it has been argued that 'work' is now generally assumed to encompass play, domestic life, etc. and that CSCW may need to broaden its focus to other types of group interaction (Crabtree et al., 2005; Twidale et al., 2005).

Mobile groups are particularly challenging for traditional CSCW research methods. Groups can disperse and are difficult to observe (Axup et al., 2005). Participants can move for long periods of time. They are immersed in rapidly changing social situations. They regularly experience different kinds of mobility with differing levels of stability, and often pause movement irregularly (Axup and Viller, 2005a). We believe the methods listed above are starting points for the generation of new exploratory methods which are more appropriate for mobile group development projects. They will undoubtedly need adaptation to fit different physical and social circumstances, and study aims.

5.2 Methods To Fit and Test The Situation

In our experience, there is no method that fits every situation. Lofland and Lofland advise that "Some settings or aspects of social life are easier to research than others. Gathering rich data through observation in open public settings can usually be accomplished with a minimum of misadventure." (Lofland and Lofland, 1995) Methods have different structural strengths and weaknesses, work better or worse in certain social settings and fit some research questions better than others. Choosing methods from a wide variety of options and then adapting them to fit the situation should be a standard activity which helps to decrease the likelihood of misadventure in mobile research.

Particularly challenging situations often produce opportunities for creating new methods, or significant changes to existing methods. New technologies (e.g. digital audio recorders capable of recording a full day, or travel blogs) offer the ability to run studies differently. We have found that predicting the limitations of existing methods in a new setting is very difficult. Methods failed us for a variety of reasons including: transgression of social norms, lack of quality results under the circumstances, and use of improper supporting technologies.

Piloting methods on a small scale in untested environments is often necessary before larger studies are conducted. Furthermore, a failed pilot of a method usually produces interesting results. The social network board failed (in our research setting) because backpacker networks are extremely dynamic. However this wasn't well understood before trialling the method. Since the method consisted of a piece of foam-core and sticky-notes, the minimal time and expense lost was well worth the lesson we learned about our intended

users. This echoes comments about the iterative nature of requirements engineering processes and the use of prototyping to evaluate requirements (Sommerville and Sawyer, 1997, pp. 366-367).

5.3 Effectiveness of In-situ Methods for Mobile Groups

It has been argued that evaluative field studies (e.g. in-situ usability testing) are not as cost-effective as lab-based testing because they do not discover a significant number of new usability problems (Kjeldskov, Skov et al., 2004; Pedell et al., 2003). While all of the methods presented above are not primarily designed for evaluative purposes, they do indicate that the environment and social situations of backpackers strongly affect how and if backpackers would use certain mobile technologies. An inherent presumption of usability testing is that users will use the device for the expected reasons. Some usability testing supports user-generated tasks or scenarios (Rubin, 1994), but this may be ineffective for new services and non-use is usually not an option. In our experience, backpackers used both prototypes and other technologies (e.g. phone, ipod, camera) when a compatible situation presented itself. For instance: a backpacker answered her phone when it rang, an ipod was turned on when discussion became boring, and cameras were pulled out when an interesting animal hopped by. However, most of the time these devices were not used or visible. In-lab testing wouldn't be able to accurately determine when or if features would be used and why.

It is likely that some types of device interaction will be similar in-lab and in-situ. For instance, a common usability problem such as poorly labelled buttons is likely to be found in both settings. However, by working in-situ we observed many broader potential usability issues which formed part of the product requirements. For instance, interruption was a common issue for individual backpackers interacting with their natural social and physical environments. Accordingly we advise that mobile tourist assistants have interface designs that support auto-saving, undo, and default to last operation features. Essentially this is setting the requirement before it becomes a usability problem. Usability testing in the field would occasionally discover this problem, but lab testing probably would not, as it doesn't have an appropriate physical and social context. It is likely that some types of potential problems will only be discovered in-situ and that it is better if they are discovered earlier with lower-fidelity prototypes. Whether these undiscovered problems are important enough to warrant the effort in finding them depends on the development situation.

6. CONCLUSIONS

Research methods used in five different types of backpacker studies have been described, and their usage reflected upon. We experienced a number of problems applying typical methods, and adapted and created new methods as required by the project and research situation. Methods used in the studies include: contextual interviews and site surveys, participatory activities, field trips, team ethnography, contextual questionnaires, and electronic diary methods. Standard methods seldom work perfectly in new or challenging situations. Finding little used methods or adapting common ones should be a standard part of the research or development process. We advise use of exploratory in-situ methods to determine higher-level usage issues early.

7. ACKNOWLEDGMENTS

8. REFERENCES

South Australian Tourism Commission (2004): *2003/2004 Research Fact Sheet - Backpacker Tourism*, from http://www.tourism.sa.gov.au/publications/FastFacts/PDFDocument/backpackerNov04.pdf

Axup, Jeff, and Stephen Viller (2005a): *Augmenting Travel Gossip: Design For Mobile Communities.* In the Proceedings of OzCHI 2005, Canberra, Australia 21-25 November.

Axup, Jeff, and Stephen Viller (2005b): Formative Research Methods For The Extremely Mobile: Supporting Community Interaction Amongst Backpackers. *Presented at workshop: "Appropriate Methods for Design in Complex and Sensitive Settings" at OzCHI 2005.*

Axup, Jeff, Stephen Viller, and Nicola Bidwell (2005): *Usability of a Mobile, Group Communication Prototype While Rendezvousing.* Proceedings of 2005 International Symposium on Collaborative Technologies and Systems - Special Session on Mobile Collaborative Work, St. Louis May 15-20, 2005.

Ballen, Felipe (2004): *Backpackers in Brisbane 2004 - A report prepared for the Brisbane Backpacker and Adventure Association.*

Beck, Elena T., Morten K. Christiansen, Jesper Kjeldskov, Nikolaj Kolbe, and Jan Stage (2003): Experimental Evaluation of Techniques for Usability Testing of Mobile Systems in a Laboratory Setting. In S Viller & P Wyeth (Eds.), *Proceedings of OzCHI2003*. Brisbane, Australia.

Bellotti, Victoria, and Sara Bly (1996): Walking away from the desktop computer: distributed collaboration and mobility in a product design team. In *Proceedings of the 1996 ACM conference on Computer supported cooperative work* (pp. 209-218). Boston, Massachusetts, United States: ACM Press.

Berg, Sara, Alex S. Taylor, and Richard Harper (2003): *Mobile Phones for the Next Generation: Device Designs for Teenagers.* CHI 2003, Ft. Lauderdale, Florida, USA April 5–10.

Binder, Thomas (1999): Setting the stage for improvised video scenarios. In *CHI '99 extended abstracts on Human factors in computing systems* (pp. 230-231). Pittsburgh, Pennsylvania: ACM Press.

Boehm, B. W. (1988): A spiral model of software development and enhancement. *Computer, 21*(5), 61-72.

Brandt, Eva (2005a): *Event-Driven Product Development: Collaboration and learning.*

Brandt, Eva (2005b): *How tangible mock-ups support design collaboration.* Center for Design Research.

Brewster, Stephen (2002): Overcoming the Lack of Screen Space on Mobile Computers. *Personal and Ubiquitous Computing, 6*(3), 188--205.

Carter, S., J. Mankoff, and P. Goddi (2004): Building Connections among Loosely Coupled Groups: Hebb's Rule at Work. In *Computer Supported Cooperative Work* (Vol. 13, pp. 305-327): Kluwer.

Chalmers, Matthew (2004): A Historical View of Context. In *Computer Supported Cooperative Work* (Vol. 13, pp. 223-247): Kluwer Academic Publishers.

Cheverst, Keith, Dan Fitton, Mark Rouncefield, and Connor Graham (2004): 'Smart Mobs' and Technology Probes: Evaluating Texting at Work. In *ECITE 2004*.

Cheverst, Keith, Keith Mitchell, Nigel Davies, and Gareth Smith (2000): Exploiting context to support social awareness and social navigation. *SIGGROUP Bull., 21*(3), 43-48.

Chincholle, Didier, Mikael Goldstein, Marcus Nyberg, and Mikael Eriksson (2002): Lost or Found? A Usability Evaluation of a Mobile Navigation and Location-Based Service. In F. Paterno (Ed.), *Mobile HCI* (pp. 211-224): Springer-Verlag.

Colbert, Martin (2002): *A Diary Study of Rendezvousing: Group Size, Time Pressure and Connectivity.* Mobile HCI

Colbert, Martin (2005): User experience of communication before and during rendezvous: interim results. *Personal Ubiquitous Comput., 9*(3), 134-141.

Conrath, David W., Christopher A. Higgins, and Ronald J. McClean (1983): A comparison of the reliability of questionnaire versus diary data. *Social Networks, 5*(3), 315-322.

Crabtree, Andy, Terry Hemmings, Tom Rodden, Keith Cheverst, Karen Clarke, Guy Dewsbury, et al. (2003): *Designing with Care: Adapting Cultural Probes to Inform Design in Sensitive Settings.* Proceedings of OzCHI2003, Brisbane, Australia 26-28 November.

Crabtree, Andy, Tom Rodden, and Steve Benford (2005): Moving with the Times: IT Research and the Boundaries of CSCW. *Computer Supported Cooperative Work (CSCW), 14*(3), 217-251.

Dahlbäck, Nils, Arne Jönsson, and Lars Ahrenberg (1993): Wizard of Oz studies: why and how. In *Proceedings of the 1st international conference on Intelligent user interfaces* (pp. 193-200). Orlando, Florida, United States: ACM Press.

Dearman, David, Kirstie Hawkey, and Kori M. Inkpen (2005): Effect of location-awareness on rendezvous behaviour. In *CHI '05 extended abstracts on Human factors in computing systems* (pp. 1929-1932). Portland, OR, USA: ACM Press.

Eagle, N., and A. Pentland (2005): Social serendipity: mobilizing social software. *Pervasive Computing, IEEE, 4*(2), 28-34.

Ehn, Pelle, and Morten Kyng (1992): Cardboard computers: mocking-it-up or hands-on the future. In *Design at work: cooperative design of computer systems* (pp. 169-196): Lawrence Erlbaum Associates, Inc.

Erickson, Thomas, and Wendy A. Kellogg (2002): Social Translucence: Using Minimalist Visualizations of Social Activity to Support Collective Interaction. In K. Höök, D. Benyon & A Munroe (Eds.), *Readings in the Social Navigation of Information Space*: Springer.

Erickson, Thomas, David N. Smith, Wendy A. Kellogg, Mark Laff, John T. Richards, and Erin Bradner (1999): Socially Translucent Systems: Social Proxies, Persistent Conversation, and the Design of "Babble". *Human Factors in Computing Systems: The Proceedings of CHI '99.*

Esbjörnsson, Mattias, Oskar Juhlin, and Mattias Östergren (2004): Traffic encounters and Hocman: associating motorcycle ethnography with design. *Personal and Ubiquitous Computing, 8*(2), 92-99.

Floyd, Christiane, Wolf-Michael Mehl, Fanny-Michaela Resin, Gerhard Schmidt, and Gregor Wolf (1989): Out of Scandinavia: Alternative Approaches to Software Design and System Development. In *HUMAN-COMPUTER INTERACTION, 1989* (Vol. 4, pp. 253-350).

Gammack, John G (2002): Constructive design environments: implementing end user systems development. In Tonya Barrier (Ed.), *2002* (pp. 153-173). Hershey: IRM Press.

Gant, Diana, and Sara Kiesler (2002): Blurring the Boundaries: Cell Phones, Mobility, and the Line between Work and Personal Life. In Barry Brown, Nicola Green & Richard Harper (Eds.), *Wireless world : social and interactional aspects of the mobile age* (pp. Chapter 9, 121-131). London ; New York: Springer.

Gaver, William W., Andrew Boucher, Sarah Pennington, and Brendan Walker (2004): Cultural probes and the value of uncertainty. *interactions, 11*(5), 53-56.

Gaver, William W., Tony Dunne, and Elena Pacenti (1999): Design: Cultural probes. *Interactions, 6*(1), 21-29.

Greenberg, Saul (2001): Context as a Dynamic Construct. *HUMAN-COMPUTER INTERACTION, 16*, 257–268.

Grinter, Rebecca E., and Margery Eldridge (2001): *y do tngrs luv 2 txt msg?* Proceedings of the Seventh European Conference on Computer-Supported Cooperative Work ECSCW '01, Bonn, Germany

Grinter, Rebecca E., and Margery Eldridge (2003): Wan2tlk?: Everyday Text Messaging. In *Proceedings of CHI'03*. Ft. Lauderdale, Florida, USA: ACM.

Hagen, Penny, Toni Robertson, Melanie Kan, and Kirsten Sadler (2005): *Emerging Research Methods For Understanding Mobile Technology Use.* Proceedings of OZCHI 2005, Canberra, Australia

Harr, Rikard (2002): Exploring the Concept of Group Interaction through Action in a Mobile Context. In *DEXA* (pp. 567-576).

Helander, Martin, Thomas K. Landauer, and Prasad V. Prabhu (1997): *Handbook of human-computer interaction.* (2nd, completely rev. ed.). Amsterdam ; New York: Elsevier.

Higgins, Christopher A., Ronald J. McClean, and David W. Conrath (1985): The accuracy and biases of diary communication data. *Social Networks, 7*(2), 173-187.

Hudson, James M., Jim Christensen, Wendy A. Kellogg, and Thomas Erickson (2002): "I'd be overwhelmed, but it's just one more thing to do": availability and interruption in research management. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 97--104): ACM Press.

Hutchins, Edwin (1995): *Cognition in the wild.* Cambridge, Mass.: MIT Press.

Hutchinson, Hilary, Wendy Mackay, Bosse Westerlund, Benjamin B. Bederson, Allison Druin, Catherine Plaisant, et al. (2003): Technology Probes: Inspiring Design for and with Families. In *CHI 2003* (April 5–10, ed., Vol. 5, Issue 1). Ft. Lauderdale, Florida: ACM.

Iacucci, Giulio, Kari Kuutti, and Mervi Ranta (2000): *On the Move with a Magic Thing: Role Playing in Concept Design of Mobile Services and Devices.* DIS'00, Brooklyn, New York

Ito, Mizuko, and Daisuke Okabe (2003): *Mobile Phones, Japanese Youth, and the Re-placement of Social Contact.* Front Stage - Back Stage: Mobile Communication and the Renegotiation of the Social Sphere, Grimstad, Norway June 22-24.

Ito, Mizuko, and Daisuke Okabe (2005): *Technosocial Situations: Emergent Structurings of Mobile Email Use.* Personal, Portable, Pedestrian Mobile Phones in Japanese Life

Johnson, Peter (1998): *Usability and mobility: Interactions on the move.* In proceedings of EPSRC/BCS Workshop, Glasgow

Kaasinen, E (2005): User acceptance of location-aware mobile guides based on seven field studies. In *Behaviour & Information Technology,* (Vol. 24, pp. 37-49).

Wired News (1999): *The Philosophy of the Handheld*. Retrieved 2 October, 2005, from http://www.wired.com/news/technology/0,1282,32010,00.html

Kellogg, Thomas Erickson and Wendy A. (2002): Social Translucence: Using Minimalist Visualizations of Social Activity to Support Collective Interaction. In D. Benyon K. Höök, A Munroe (Ed.), *Readings in the Social Navigation of Information Space*: Springer.

Kjeldskov, Jesper, Martin R. Gibbs, Frank Vetere, Steve Howard, Sonja Pedell, Karen Mecoles, et al. (2004): Using Cultural Probes to Explore Mediated Intimacy. In.

Kjeldskov, Jesper, and Connor Graham (2003): A Review of Mobile HCI Research Methods. In L. Chittaro (Ed.), *Mobile HCI* (pp. 317-335): Springer-Verlag.

Kjeldskov, Jesper, Mikael B. Skov, Benedikte S. Als, and Rune T. Høegh (2004): *Is it Worth the Hassle? Exploring the Added Value of Evaluating the Usability of Context-Aware Mobile Systems in the Field.* 6th International Mobile HCI 2004, Glasgow, Scotland

Kotonya, Gerald, and Ian Sommerville (1998): *Requirements engineering : processes and techniques.* New York: John Wiley.

Kujala, S., M. Kauppinen, and S. Rekola (2001): *Bridging the Gap between User Needs and User Requirements.* Advances in Human-Computer Interaction I (Proceedings of the Panhellenic Conference with International Participation in Human-Computer Interaction PC-HCI 2001)

Landay, James A., and Brad A. Myers (1995): Interactive sketching for the early stages of user interface design. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 43-50). Denver, Colorado, United States: ACM Press/Addison-Wesley Publishing Co.

Leinbach, Charles (2002): Managing for Breakthroughs: A View from Industrial Design. In S. Squires, Byrne, B. (Ed.), *Creating Breakthrough Ideas: The Collaboration of Anthropologists and Designers in the Product Development Process* (pp. 3-16). Westport, CT: Development Industry, Greenwood Publishing.

Leinonen, Piritta, Sanna Järvelä, and Päivi Häkkinen (2005): Conceptualizing the Awareness of Collaboration: A Qualitative Study of a Global Virtual Team. *Computer Supported Cooperative Work (CSCW), 14*(4), 301-322.

Lin, James, Mark W. Newman, Jason I. Hong, and James A. Landay (2000): DENIM: finding a tighter fit between tools and practice for Web site design. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 510-517). The Hague, The Netherlands: ACM Press.

Lofland, John, and Lyn H. Lofland (1995): *Analyzing social settings : a guide to qualitative observation and analysis.* (3rd ed.). Belmont, Calif.: Wadsworth.

Loker-Murphy, Laurie, and Philip L. Pearce (1995): Young Budget Travelers: Backpacker In Australia. *Annals of Tourism Research, 22*(4), 819-843.

Loker-Murphy, Laurie, and Philip L. Pearce (1995, p. 830-831): Young Budget Travelers: Backpacker In Australia. *Annals of Tourism Research, 22*(4), 819-843.

Luff, Paul, and Christian Heath (1998): Mobility in Collaboration. In *Proceedings of CSCW'98* (pp. 305-314).

Mackay, Wendy E., and Anne-Laure Fayard (1997): HCI, natural science and design: a framework for triangulation across disciplines. In *Proceedings of the conference on Designing interactive systems: processes, practices, methods, and techniques* (pp. 223-234). Amsterdam, The Netherlands: ACM Press.

Mayhew, Deborah J. (1999): *The usability engineering lifecycle : a practioner's handbook for user interface design.* San Francisco, Calif.: Morgan Kaufmann Publishers.

Millen, David R. (2000): *Rapid Ethnography: Time Deepening Strategies for HCI Field Research.* DIS, New York

Mohapatra, Prasant, Chao Gui, and Jian Li (2004): Group Communications In Mobile Ad Hoc Networks. In *Computer*: ITEE.

Olson, Gary M., and Judith S. Olson (2000): Distance Matters. *Human-Computer Interaction, 15*(2&3), 139-178.

Palen, Leysia, and Marilyn Salzman (2002): Voice-Mail Diary Studies for Naturalistic Data Capture under Mobile Conditions. *Computer Supported Cooperative Work.*

Paulos, Eric, and Tom Jenkins (2005): Urban probes: encountering our emerging urban atmospheres. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 341-350). Portland, Oregon, USA: ACM Press.

Pedell, Sonja, Connor Graham, Jesper Kjeldskov, and Jessica Davies nee Smith (2003): *Mobile Evaluation: What the Data and the Metadata Told Us.* OzCHI, Brisbane, Australia 26-28 November.

Pinelle, David, and Carl Gutwin (2003): Designing for Loose Coupling in Mobile Groups.

Pospischil, Gunther, Martina Umlauft, and Elke Michlmayr (2002): Designing LoL@, a Mobile Tourist Guide for UMTS. In F. Paterno (Ed.), *Mobile HCI* (LNCS 2411 ed., pp. 140–154): Springer-Verlag.

Preece, Jenny (1994): *Human-computer interaction.* Wokingham, England ; Reading, Mass.: Addison-Wesley Pub. Co.

Preece, Jenny, Helen Sharp, and Yvonne Rogers (2002): *Interaction design : beyond human-computer interaction.* New York: J. Wiley & Sons.

Ranson, David S., Emily S. Patterson, Daniel L. Kidwell, Gavin A. Renner, Mike L. Matthews, Jim M. Corban, et al. (1996): Rapid Scout: bridging the gulf between physical and virtual environments. In *Proceedings of the SIGCHI conference on Human factors in computing systems: common ground* (pp. 442-449). Vancouver, British Columbia, Canada: ACM Press.

Richards, Greg, and Julie Wilson (2004): *The global nomad : backpacker travel in theory and practice.* Clevedon ; Buffalo, N.Y.: Channel View Publications.

Rouncefield, Mark, Stephen Viller, John A. Hughes, and Tom Rodden (1995): Working with 'constant interruption': CSCW and the small office. *The Information Society, 11*(3), 173-199.

Rubin, Jeffrey (1994): *Handbook of usability testing : how to plan, design, and conduct effective tests.* New York: Wiley.

Ruhleder, Karen, and Brigitte Jordan (1997): *Capturing Complex, Distributed Activities: Video-Based Interaction Analysis as a Component of Workplace Ethnography.* Proceedings of the IFIP TC8 WG 8.2 - International Conference on Information Systems and Qualitative Research, Philadelphia, USA 31 May- 3rd June.

Schroder, Kerstin E. E., Michael P. Carey, and Peter A. Vanable (2003): Methodological Challenges in Research on Sexual Risk Behavior: II. Accuracy of Self-Reports. *Annals of Behavioral Medicine, 26*(2), 104-123.

Scollon, Christie Napa, Chu Kim-Prieto, and Ed Diener (2003): Experience Sampling: Promises and Pitfalls, Strengths and Weaknesses. In *Journal of Happiness Studies* (Vol. 4, pp. 5-34): Kluwer Academic Publishers.

Snyder, Carolyn (2003): *Paper prototyping : the fast and easy way to design and refine user interfaces.* San Francisco, Calif.: M. Kaufmann Pub.

Sommerville, Ian, and Pete Sawyer (1997): *Requirements engineering : a good practice guide.* New York: John Wiley & Sons.

Sperschneider, Werner, and Kirsten Bagger (2003): Ethnographic Fieldwork Under Industrial Constraints: Toward Design-in-Context. *International Journal of Human-Computer Interaction, 15*(1), 41-50.

Strub, Henry B. (1997): ConcertTalk: A Weekend With a Portable Audio Space. In *Proceedings of the IFIP TC13 International Conference on Human-Computer Interaction* (pp. 381-388): Chapman & Hall, Ltd.

Tamminen, Sakari, Antti Oulasvirta, Kalle Toiskallio, and Anu Kankainen (2004): Understanding mobile contexts. *Personal Ubiquitous Comput., 8*(2), 135-143.

Twidale, M. B., X. C. Wang, and D. M. Hinn (2005): *CSC*: Computer Supported Collaborative Work, Learning, and Play.* Proceedings, Computer Supported Collaborative Learning (CSCL) conference, Taipei, Taiwan May 30-June 4.

Weilenmann, Alexandra (2001a): Mobile Methodologies: Experiences from Studies of Mobile Technologies-in-Use. In Bjørnestad et al. (Ed.), *Information Systems Research Seminar* (Vol. 3, pp. 243-257).

Weilenmann, Alexandra (2001b): Negotiating Use: Making Sense of Mobile Technology. *Personal and Ubiquitous Computing*(5), 137–145.

Weilenmann, Alexandra (2003): *Doing mobility.* Doctoral Thesis, Göteborg.

Weilenmann, Alexandra, and Catrine Larsson (2002): Local Use and Sharing of Mobile Phones. In Barry Brown, Nicola Green & Richard Harper (Eds.), *Wireless world : social and interactional aspects of the mobile age* (pp. Chapter 7, 92-107). London ; New York: Springer.

Woodruff, Allison, and Paul M. Aoki (2003): *Media affordances of a mobile push-to-talk communication service.* Palo Alto Research Center.

Woodruff, Allison, and Paul M. Aoki (2004): Push-to-Talk Social Talk. *Computer Supported Cooperative Work (CSCW), 13*(5 - 6), 409-441.

Woodruff, Allison, Paul M. Aoki, Amy Hurst, and Margaret H. Szymanski (2001): *Electronic Guidebooks and Visitor Attention.* Proc. 6th Int'l Cultural Heritage Informatics Meeting, Milan, Italy
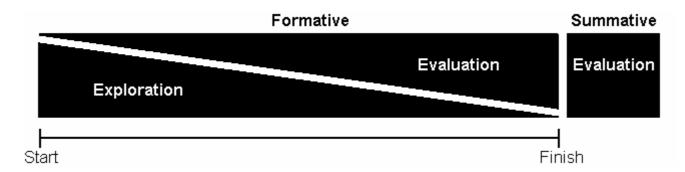
9. Legends

Figure 1: Exploration and evaluation happen to different degrees during use of formative methods.
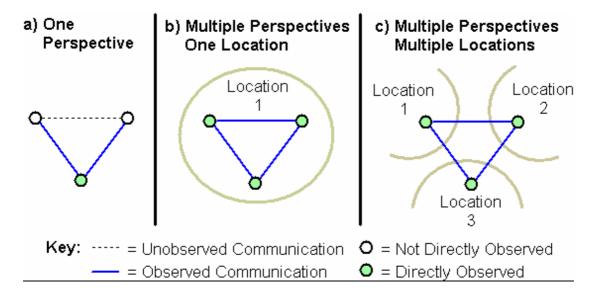

Figure 2: a) One person's perspective on the many; b) many people's perspective on the collocated many; c) many people's perspective on the distributed many.
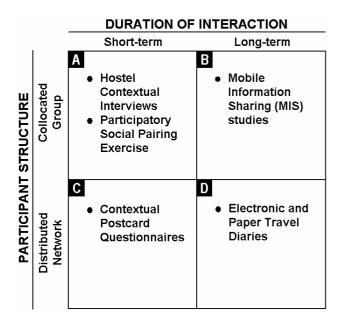
Figure 3: Methods with different strengths were used to explore different aspects of backpacker behaviour.

Figure 4: Social Network Board

Figure 5: A hostel notice board which has been cleaned for analysis purposes.

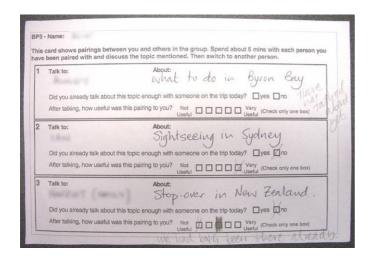Figure 6: Describing social ties to friends and family members while travelling.

Figure 7: A pairing form used in the participatory social pairing exercise.

Figure 8: Seven designs chosen by backpackers, showing the fictional functions and modifications to the

original blank foam prototypes.

Figure 9: "Using" a foam prototype and a map while walking around Lone-Pine Koala Sanctuary.

Figure 10: Postcards described the study and asked short contextually oriented questions.
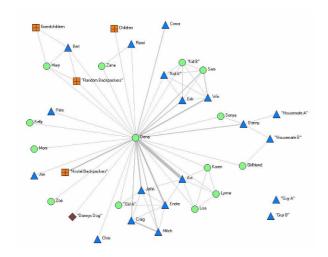

Figure 11: Social ties between a backpacker and those she met over 3 weeks of travelling.

Figure 12: A travel blog for WhereSheGoes on TravelPod.com describing three years of travel.

10. Tables

Table 1: Open-ended Postcard Questions
Version 1
- How did you find out about your present location before you decided to come here?   - Think back to the last group of strangers you talked to. How did you meet and what did you do with them?   - If you could have any travel question answered for you, what would it be?
Version 2
- If you could contact anyone right now, who would you contact and why?   - Based on your recent travel experience is there something you would advise other backpackers NOT to do? Why?   - If you could leave a message for a future backpacker in the place you are in now, what would it be?
Version 3
- Is there something in this city that you want to know more about? What is it?   - The last time you contacted someone (payphone, mobile, Internet, SMS, chat, email, etc.) who did you contact and why?   - What is your greatest concern or worry about travelling at the moment?