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Co-creating New Mobile Devices for Groups

During Field Trips: MIS-2 Study

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Abstract

The second iteration of the Mobile Information Sharing studies (MIS-2) aimed to validate results from the previous study and to introduce mobile low-fidelity prototypes in a natural tourist activity. Seven foam prototypes with fictional functionality descriptions were carried and used by backpackers during the course of a tourist field trip. The trip consisted of walking through a city centre to a boat, taking a boat cruise, walking around an animal park and then taking the same journey back to their hostel. Backpackers added features and discussed these devices in a workshop. Variations to previous research methods included increased use of digital cameras and the use of three simultaneous observers for ethnographic observation. A repetition of the previous social pairing activity was conducted which explored different types of social ties with more participants.

Study results include a rich understanding of travel conversation, in-situ effects of mobile device usage, and verification of research methods. Subgroups of participants within the study didn't communicate much between each other and provided an interesting case of backpackers failing to connect even though they desired to. A field trip representing a typical tourist activity produced a number of situations where mobile device features were requested by participants. The social pairing activity produced some useful information for participants and provided design recommendations for social pairing systems. 11 design requirements for mobile travel devices were generated from observations and discussions with backpackers. Additional analysis produced 23 proposed product features. Recommendations have been made for improvements to the study design and methods for future mobile group research.

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1 Introduction

The backpacker portion of the Communities & Places project is focused on understanding the needs and behaviour of budget travellers. The first iteration of the Mobile Information Sharing (MIS-1) study was run in March 2005 to investigate communication among mobile groups and explore possibilities for mobile technologies. A second iteration of the study (MIS-2) was run in July 2005 to verify previous results and explore in-situ usage of mobile prototypes, and is the subject of this document. The combination of the two studies resulted in design concepts and prototypes for mobile travel assistant technologies for backpackers.

This document begins with a review of related literature not covered in the previous report (Axup & Viller, 2005d). This is followed by a description of the methods used in the study. The results section is in three parts: mobile group behaviour and communication, design outcomes, and research methods used. The discussion section covers issues related to design for extreme mobility and utility of research methods. Recommended improvements to the research methods used are provided, as well as a list of proposed design concepts.

2 Literature Review

The following section covers related research that was not covered in the MIS-1 summary document. These include the action research framework, low-fidelity prototyping methods using materials such as cardboard and foam, and an overview of existing mobile social software concepts.

2.1 Action Research

Action research (AR) or action theory (AT) is a research framework (or theory or meta-methodology) which developed out of agricultural, education and community development research disciplines (Hearn & Foth, 2004; Reason & Bradbury, 2001). As a framework, AR does not specify methods and can be quantitative or qualitative in nature. A variant of AR called ethnographic action research (EAR) uses qualitative and observational techniques, often in developing nations, to recruit those being studied as active researchers. Hearn and Foth indicate AR has a "focus on participative development, soft or agile methods, qualitative analysis, adaptive procedures, reflective practice, and informed action." (Hearn & Foth, 2004) There is also a related area called network action research (NAR) which emphasises social networks of researcher communities and uses this to increase effectiveness (Foth, 2006).

AR is an approach which emphasises practical research, intending to directly alter the studied environment if change is needed. It advocates the development of a "research culture" which includes stakeholders from many different groups affected by, and helping to conduct the research. Some versions of it incorporate a bottom-up model where individual members are encouraged to share information directly between each other, but also to share it with a larger group of confederated scientists. AR advocates a cyclical process of planning, doing, observation and reflection (Tacchi, 2003). Consequently the framework can be similar to standard development processes. However, the emphasis on doing research alongside development and allowing effected people to actively contribute to research help to differentiate it. AR frequently places less emphasis on designing technology and more on finding solutions to practical issues (which may include technological tools).

Management of ethical concerns raised as a consequence of research programs is also a critical part of AR (Avison, Lau, Myers, & Nielsen, 1999). In some cases this results in less emphasis on producing profitable products and instead focuses on social emancipation.

There is a strong similarity between AR and participatory design (PD). PD comes from Scandinavian software development traditions where unions were powerful and encouraged extensive participation of affected workers (Floyd, Mehl, Resin, Schmidt, & Wolf, 1989). PD is also a design theory, but it is strongly correlated with certain types of methods with encourage direct interaction with future users. While PD does acknowledge the effects of design on future users behaviour, it does not actively try to cause societal change to the degree which AR embraces. PD research usually focuses on the design of a particular product for a particular group of users. There are similar controversial questions regarding how participants should be involved in the development process in both AR and PD.

There has been relatively little research into the application of AR to mobile device design. As a framework, AR focuses primarily on a cyclical process of observation, intervention, and evaluation, but it also carries a concern with practical research and with understanding the effects of implementing research outcomes. If AR were to be used to design mobile devices, it would advocate a cyclical process attentive to the tangible social effects of mobile device usage. It would also encourage mobile user groups to actively participate in new mobile hardware and software development. Several studies have used participatory methods for mobile device design. These incorporate some of the aspects of AR which encourage collaboration between users and researchers (Axup & Viller, 2005e; Iacucci, Kuutti, & Ranta, 2000).

2.2 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 & Pentland, 2005; Mohapatra, Gui, & Li, 2004; Pospischil, Umlauft, & Michlmayr, 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, Mitchell, Davies, & Smith, 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 & 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 & 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 & 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, Hawkey, & Inkpen, 2005).

2.3   Mobile Social Software

Mobile social software (MoSoSo) is a recent extension of large-screen, commercial and academic software that helps to connect people and visualize social networks. Commercial services such as Tribe.net and Friendster.com record personal profiles of their users and then use them to form networks of 'friends of a friend' (FOAF). There is a machine-readable document format by the same name that aims to standardize components and create an open standard for profiles[1]. This information can then be leveraged for dating or employment introductions, among other possibilities. Academic work has often primarily looked at tracking social ties between people, often using electronic communications as data sources (Gastavo, 2005; McArthur & Bruza, 2003).

With the advent of larger screen mobile devices with Internet connectivity, there has been some movement towards connecting them into existing social software systems and creating entirely new mobile social services. For example: Flickr[2] allows sharing photographs among contacts via a mobile phone; Dodgeball[3] supports making announcements to friends in a geographical area; and Txtmob[4] enables rapid mobile discussion lists.

Wearable computing researchers have built systems to exchange profile information to enable users to collaborate on collective activities (Kortuem, Segall, & Thompson, 1999). Other work on mobile products such as city guides has looked at adding the ability to contact friends, or ask for recommendations based on social networks (Cheverst et al., 2000). Purpose-built social pairing systems have been built using bluetooth enabled mobile phones and used in situations such as academic conferences (Eagle & Pentland, 2005). Other research has produced a number of social applications including a phone-based system to facilitate dating (Beale, 2005). Both of the preceding studies take a highly technical approach to the research and perform little analysis of existing social behaviour prior to technology introduction.

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[1] www.foaf-project.org

[2] www.flickr.com

[3] www.dodgeball.com

[4] www.txtmob.com

This increases the likelihood of system designs which mesh poorly with extremely complex and nuanced normative systems in existing social settings.

The methods used in the MIS studies began with a simple observation of existing behaviour in the target tourism domain. Additional studies had also explored existing behaviour and culture prior to this (Axup & Viller, 2005a). MIS-2 introduced non-functional prototypes into this environment to see how behaviour would change and what opportunities for future functionality would present themselves. In the next section we discuss the structure and aims of the study.

3 Method

We conducted two studies 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. This paper covers MIS-2 and a previous paper covers MIS-1 (Axup & Viller, 2005d). The method for MIS-2 was very similar to MIS-1; differences included the introduction of mobile prototypes during the field trip, a design debriefing after returning to the hostel and use of a third observer.

A group of seven backpackers was recruited from a hostel in Brisbane, Australia. They participated in a day-long study, which included two workshops at the hostel, and a "field trip" consisting of a boat cruise and a visit to an animal park. The field trip out of the hostel 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. This queried participants about 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 (*2003/2004 Research Fact Sheet - Backpacker Tourism*, 2004, personal communication with hostel manager) 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 the park visit are inexpensive and common activities for backpackers and other tourists.

The backpackers were accompanied by three researchers during the field trip. All backpackers were continuously observed, with the exception of cases where a backpacker left by themselves, or practicalities such as bathrooms or eating. One researcher conducted workshops at the hostel and took notes and pictures during the field trip. Two more researchers also took notes and pictures during the field trip. Two additional researchers prepared forms and assisted in the final workshop at the hostel. Three backpackers who volunteered wore digital audio recorders throughout the day, primarily recording their own speech and those they talked with. As a consequence of previous results (Axup & Viller, 2005d), participants were queried about pre-existing relationships, and one recorder was distributed to each pre-existing group to maximize recording coverage. The recorders required no interaction by participants and were not easily recognizable to non-participants. 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.

The research study began at 8:30 a.m. and finished at 5:00 p.m. It began with a questionnaire (see Appendix A), 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. Cards with emergency

numbers and a summary of approximate times for activities during the day were distributed (see Appendix D).

Figure 1: Prototypes offered to participants at the beginning of the study. The white paper covers shown here were removed prior to their introduction to participants, leaving foam or foam-core as the primary surface.

The participants were each asked to choose one mobile device prototype from 12 available options (see Figure 1). The fictional functions and form factors (listed left-right, top-bottom) were:

- "Ask me where to find people who know about something."
  (wrist mounted form factor, similar to large sport watches)

- "I can tell you the cheapest way to do something."
  (small flat square form factor, similar to small mobile phones)

- "I can show you where you are."
  (small flat circle form factor, similar to a pocket mirror)

- "You can leave a message at this location for other backpackers."
  (small flat oval form factor, exploring curves)

- "I can find someone who wants to buy something you have."
  (very small thin box form factor, similar to key fob USB storage devices)

- "You can talk to the group using this device, I can show you the location of other group members."
  (large thick panel form factor, similar to Apple Newton or small tablets)

- "I can find any object for you."
  (small flat irregular form factor, exploring different pocketable shapes)

- "I can tell you how much it costs to do anything."
  (small flat bell shape on lanyard, exploring bracelets)

- "I can tell people whom you choose what you are doing now."
  (small flat triangle form factor, exploring triangles and necklaces)

- "I can identify any object."
  (medium flat form factor with large hole, exploring see-through screen and larger space for input methods)

- "I can tell you what other backpackers thought about something."
  (thick pen with finger indentation form factor, to explore pointers and thin shapes)

- "I can store any ID cards, tickets, or personal items and let you use them electronically."
  (medium curving flat form factor with hole, exploring curves and hangable/attachable affordance)

Each prototype was a piece of lightweight foam with a sticky-note describing one of these fictional function attached to it. Prototype functions were chosen based on issues observed in the MIS-1 study. 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. 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. No other instructions were given about what the backpackers should do during the day.

The study was purposefully structured to avoid prescription in order to allow backpackers to act as normally as possible. Similarly, observers avoided restricting or affecting the behaviour of backpackers. The only exception to this was a quiet reminder to a couple lingering in a gift shop that the boat was leaving soon. Other high-level restrictions included the departure and arrival times of the boat which they were requested to use. However, within the larger structure of the day's activity there was a great deal of freedom left to the backpackers. In a similar fashion, very little guidance was provided concerning the prototypes. None of the backpackers were experienced in design or mobile technologies. Consequently we wanted them to envision usage of a future product without dwelling on the technology used. We were primarily interested in what situations provoked usage of the devices and what requirements they had for it. To this end we did not suggest exactly how the prototypes should be used. We were hoping that the unpredictable environment and personal characteristics of the backpackers would challenge us with new proposed functions and situations. There is a subtle balance in the design of participatory studies: sufficient detail about the prototype needs to be given to the participant, so that they know what is being built and what is desired of them. However, providing too much detail eliminates the potential of exploring alternate design paths, and is not likely to produce results that challenge existing concepts. Thus it was concluded to provide high-level fictional functions in common language, simplistic objects to use as props, and basic instructions on how to play-act with the prototypes. It was hoped that this would remove the need to consider technologies or detailed interfaces, and focus on situations, functionality and practical usage.

Three researchers and seven backpackers walked from the hostel, through the city centre and shopping mall, to the boat dock. The researchers 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.) Active attempts were made by the researchers to ask about activities the participants were doing, or to elaborate on topics they had only briefly introduced. The boat cruise lasts approximately 1.5 hours and drops off passengers at the animal park. The backpackers were given their tickets when they arrived at the park and were free to do what they wished during their 2 hours there. One exception was a brief meeting arranged for noon, in which the participants could briefly discuss how they were doing with the prototype. The backpackers reboarded the boat after the park visit, for the return cruise back to Brisbane city. Upon docking they walked approximately the same route as in the morning, back to the hostel.

The field trip was followed by a 1.5 hour discussion and participatory design activity conducted in the hostel by five researchers. Immediately upon returning, the backpackers participated in a brief group discussion. They reflected on what they talked about during the field trip, group formations throughout the day and general travel issues. They then 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. Participants were then requested to present their device prototype to the group in turn, explaining how they had used it and any modifications they had made to it. 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.

Following this, an activity exploring the utility of externally imposed matching systems was conducted. Backpackers were paired with others in the group who they had an affinity with based on their recent travel history and future travel plans. For example, BP1 had recently been to the Harbour Bridge in Sydney and BP7 intended to climb it. They were asked to spend roughly 5 minutes talking to each of the 2-3 people they had been paired with. 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 was Marketing Manager for Lonely Planet and additional discussion topics concerning guidebooks were introduced at his request.

To 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 (see Appendix D: Returned Postcard). The postcard asked if group members did activities with each other after the study and whether they contacted each other after leaving Brisbane.

4   Results

A group of seven backpackers took part in the study. They formed three pre-existing subgroups which were maintained throughout the majority of the day. There was little discussion between the subgroups even though there were many opportunities for it. The subgroups did talk a great deal amongst themselves. Prototypes were primarily used while on the boat, although some backpackers used them while walking or standing in the animal park. A variety of opportunities for introduction of new travel technologies were found and mobile group methods from MIS-1 were further refined in this study.

The results section begins with a discussion of the participants, followed by an overview of group behaviour and summaries of each of the movement stages.

Subsequent to this are more detailed discussions of technology usage, effects of mobility, and interpersonal issues. The paper concludes with design oriented results concerning requirements, feedback about design prototypes and utility of research methods.

4.1   Participants

Although it was intended that six backpackers be involved in the study, due to a miscommunication with the hostel recruiters and participant characteristics, the study ended up with seven participants. The participants formed three subgroups (see Figure 2).

Subgroup A: Three English females (all under 21 years) were old friends from school and were travelling together for a few weeks. One of them (BP7) had been travelling for longer than the other two (5.5 months) and had just joined up with the other two, who had been travelling for 5 weeks. They had known each other 8 years, were travelling South, and BP7 had recently been living in New Zealand.

Subgroup B: A Swedish male and female couple (both 26-30 years) had known each other for 5 years. They had been travelling together for 8 weeks and were also travelling South.

Subgroup C: Two English males (both under 21 years) had been friends for 11 years and were travelling North to Cairns. They had been travelling for 3 weeks.
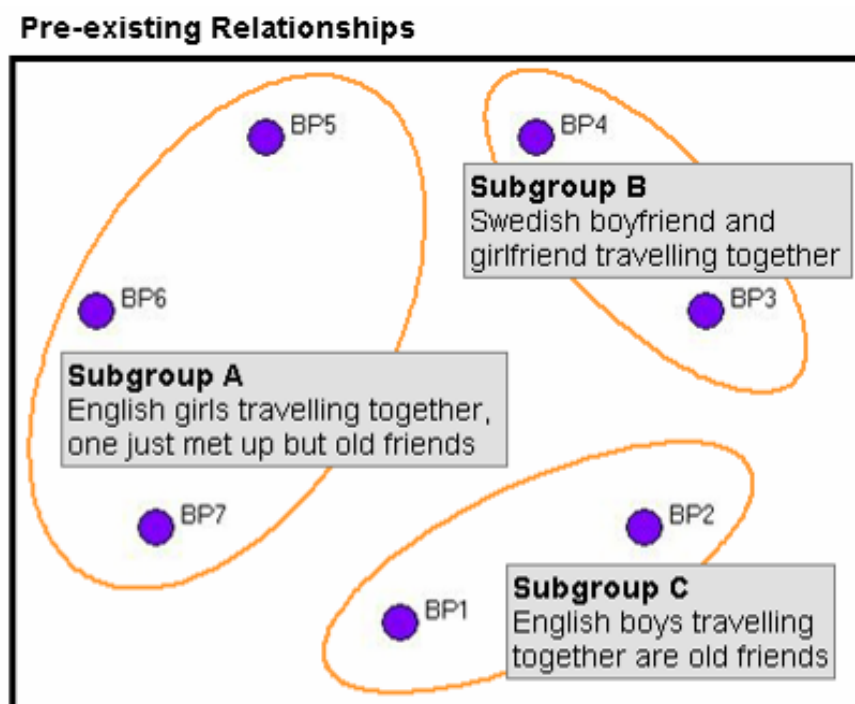

Figure 2: Participants formed three pre-existing subgroups: three female friends, a couple and two male friends.

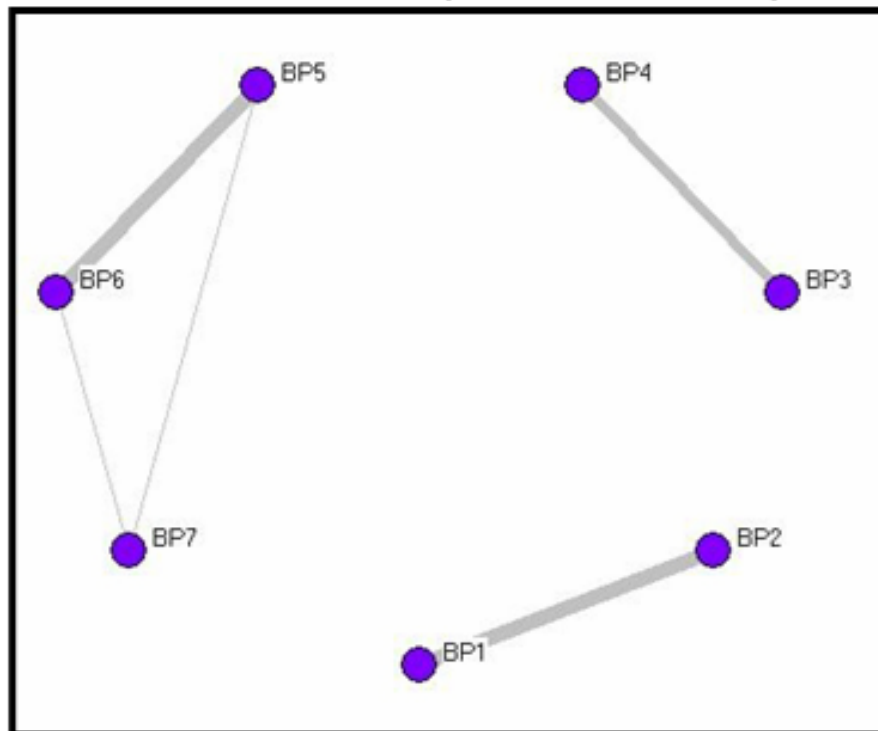**Duration of Travel This Trip With Other Participants**

Figure 3: The three subgroups can be seen based on ties representing duration they have been travelling together.

At least one member of all of the subgroups owned and carried a mobile phone while travelling. BP1 and BP2 (English males) each carried their own and used voice, SMS, GPRS, contacts and clock features. BP3 (Swedish female) carried a phone and used voice or SMS. BP7 (English female) carried a phone but said she barely used it. All the backpackers who carried phones said they contacted family, hostels or other travellers they met. We did not explore the reasons other subgroup members did not carry phones, but we observed numerous cases of sharing of equipment within the subgroups during the field trip.

4.2   Mobile Group Behaviour and Communication

The participants spent most of the day walking or sitting near other subgroup members and primarily talking only with them. This was maintained during all study stages with the exception of a few instances at the animal park and during a pause in the morning walk. In these cases, a common interest such as a 'joey' or purchased food would give them a common topic to discuss. Subgroups A and C also had short discussions while taking photos for each other. Before the field trip, there had been only a small amount of talk between the subgroups, shown by thin lines (See Figure 4). After the full day of activities, these connections had only developed slightly, and subgroup 3 had similar external ties to when they started (See Figure 5). All of the graphs, including communication frequency and interpersonal bond result from questionnaire responses before and after the field trip. Backpackers indicated time scales where appropriate, and rated other answers on a 5 point scale: 0 (never or very low) to 4 (often or very high). These values were used to by the NetDraw
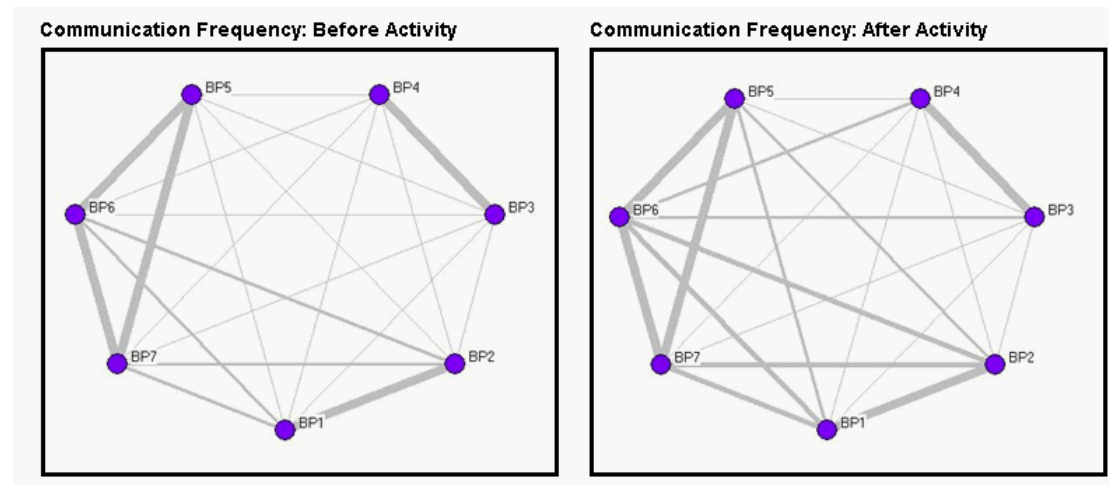
software to automatically weight line widths.

Figure 4: Self-reported communication frequency before the field trip clearly shows pre-existing groups.

Figure 5: Communication frequency after the full day field trip shows only minor growth of ties.

The low communication levels may have played a role in fairly weak interpersonal bond formations during the day, although shared experiences can stimulate bonding (Daly, 2004; Yarnal, 2004). Pre-existing bonds between long term friends can be clearly seen, but many of the backpackers never formed stronger bonds with other members of the group (see Figure 7).
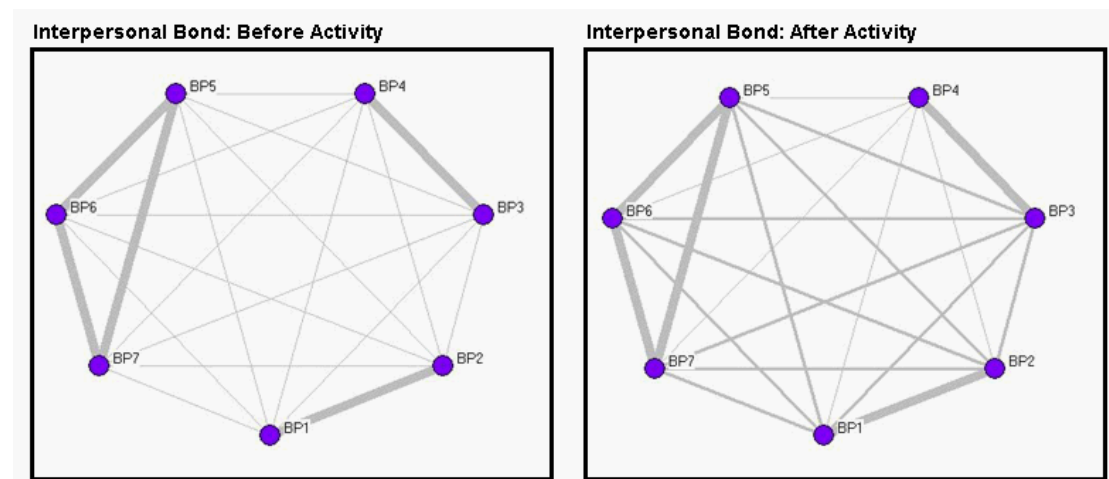
Figure 6: Reported interpersonal bond before the study commenced clearly showing friend groups.

Figure 7: A modest growth in tie strength after a full day of shared activities among group members.

The backpackers had many opportunities for discussion (Axup & Viller, 2005c), but little in the way of bridging interpersonal bond ties developed. Paradoxically BP2 commented that there hadn't been enough opportunities to talk to others. Each subgroup had an observer with them at all times, which could have affected participants' willingness to strike up conversations with others. Observers also noted that personality traits such as shyness, age and "cliquish" behaviour were likely factors. Observer 2 noted that subgroup C was "very quiet" and subgroup B sat and

did activities separately throughout the day. Subgroup B was older and often spoke in Swedish amongst themselves.

4.3   Behaviour and Environment During the Field Trip

The field trip went through six qualitatively different stages. These were: the walk to the boat, wait on the boat, cruise to the park, the animal park, the cruise back to the city and the walk back to the hostel. The behaviour and discussion during these stages is described in detail below.

4.3.1   Hostel

There was minimal discussion between the backpackers during the process of sitting down, preparing for questionnaires, and giving the study briefing. The backpackers did discuss topics within their own subgroups such as how to carry their prototypes and microphones or mentioning that "*I'm starving and want coffee.*" They also became accustomed to being recorded and observed. BP7 joked about being able to say bad things about her friends behind their backs into the microphone. The experimenters also used this time to briefly chat to each of the participants.

4.3.2   Walk to Boat

The walk from the hostel to the boat took approximately 19 minutes and involved unexpected stops. The walk followed a route down a street near the hostel, through the central Brisbane Queen Street Mall (see Figure 8), across a few streets, and down a set of stairs to the boat dock. Subgroup A had arrived the day before and had already spent time in the mall. They had discovered a food stand selling yogurt which they wanted to go to for breakfast. The entire group paused outside the stand while ordering was completed. The girls shared their yogurts amongst themselves, with Observer 1 and with subgroup C. They indicated that they "*really liked it*" and they visited the stand again later in the day.

Figure 8: Subgroup B, C (left) an observer and subgroup A (right) walking in the mall.

Figure 9: An observer sitting with subgroups A and B respectively.

Subgroup A talked to an observer about where they had been recently, "*Noosa, Hervey Bay, Frasier Island, New Zealand*" and where they intended to go. Subgroup C spoke among themselves, joking about getting tattoos and trying to determine where they were.

BP2: Did we walk this way the other day? We walked this way the other day.
BP3: No, when we walked the girls back to the river. Except the river was the other way.

It appeared that they were lost, and this is easy to do as the river bends around three sides of the city and doesn't serve as a good landmark. Subgroup 2 discussed similar topics on the walk down, related to their device prototype. "*I wonder where I am. I want to mark a point to return to again later, so I can find my way. It would be nice, if I had the same thing. My machine can find me.*"

4.3.3   Wait on Boat

All seven backpackers initially sat on the upper deck of the boat, although each subgroup chose seating so as to sit next to other subgroup members (see Figure 9). BP7 texted a friend back in England and subgroup A shared photos of Frasier Island on a digital camera screen. The backpackers changed between putting on clothing to keep warm and taking it back off when the sun came out. This involved unclipping and re-clipping the audio recorders. They played with disposable cameras, a paper travel journal and the study prototypes. Several of the backpackers briefly discussed their travel plans with different observers who sat near them. BP7 had written down "*places to go and places to see in Sydney*"; a friend had given them travel tips. "*She's going North, and we're going South. She's had a couple of good hostels. She said to go to Manly and Byron Bay.*" They had met a group of guys in a previous city, who also knew the girl who passed on the travel information. They had met her through the guys in a different city. Subgroup B spoke a bit to an observer about his studies and played with the device prototypes, describing functionality they desired.

4.3.4   Boat to Park

Shortly after the boat started its speakers began playing music and then a tourist commentary which continued for the duration of the trip to the park. The boat has a small kitchen downstairs and various backpackers ordered drinks or food during the trip. Subgroup A went downstairs to order coffee, but ran into several problems. First, they couldn't determine if they could serve themselves. Then they were unable to find cups and had to wait for assistance. Then they asked about the price and were told "7.50 each" which confused everyone including the observer. They retreated upstairs without purchasing coffee.

23 minutes into the boat ride it started to rain heavily. Nearly everyone upstairs moved downstairs into the covered cabin. The windows were open, which let in a lot of rain. This did not cease until one of the backpackers started to close the windows and boat staff assisted her. Subgroup A eventually checked the coffee price again and purchased coffees. They spoke briefly with an observer about travelling to Vietnam, read magazines and chatted extensively about relationships of people they knew at home. Members of subgroup A shared a great deal of personal history and many of their conversations were detailed and personal in nature. Many of these conversations were quite loud; they had to make an effort to speak over the continuous travel commentary coming from the intercom, which they mostly ignored.

Subgroup B chatted amongst themselves in Swedish, read magazines and wrote down ideas for their device prototypes. Subgroup C listened to the tourist commentary, slept, and didn't talk much during the boat journey.

4.3.5 Animal Park

Figure 10: Full map of Lone-Pine Koala Sanctuary which participants walked around.

Upon arriving at the Lone Pine Koala Sanctuary (see Figure 10), all of the participants walked up a path and stood in line for entry. They were given tickets by an observer as they waited in line. After entry, subgroups A, B, C went in separate directions. Subgroup A went directly to the South entrance (not pictured on map) of the Kangaroo Reserve. They were shortly followed by subgroup B, and then by subgroup C who went to the sheepdog area first. While in the Kangaroo Reserve subgroups A and C briefly interacted to watch a joey in the mother's pouch and to have subgroup C take pictures for subgroup A (see Figure 11). It started to rain while the groups were in the field and all of the groups separately headed for the East exit. Walking quickly to get out of the rain resulted in missing a hut with kangaroo information in it. Subgroup C went to look at the crocodiles and briefly told subgroup A to look at them as they passed by going the other way. Subgroup B headed back to the centre of the park to listen to a staff talk on Koalas. Subgroups A and B stood in line to have pictures taken holding a Koala.

Figure 11: Subgroup A (left) posing for a photo with a roo taken by subgroup C.

Figure 12: Discussing ideas for how to use prototypes during the field trip.

Shortly after this, all subgroups met up for a planned lunch meeting to discuss the prototypes. Before and after their presentations they chatted briefly within and between their subgroups. After roughly 10 minutes of discussing the prototypes (see Figure 12), participants either finished their lunch or left to see other portions of the park. Subgroup B walked back by the wombats and koalas, and then went back to the boat. Subgroup C quickly went up to see the birds and then walked back to the other side of the park for the sheepdog show before leaving the park. Subgroup A slowly went up by the dingos and birds and then slowly left the park via the reptile hut. They had difficulty finding a number of the animals in their cages and in identifying several signs. They guessed that the Tasmanian devil was "that way." Additionally, information signs weren't always proximal to the current location, the glare on windows made it difficult to see into cages, and animals were often hiding or sleeping.

> BP5: What are those [animals]?
>
> BP6: I didn't get to see any.
>
> BP5: Where is it? Oh ya, there it is.

The majority of the discussion while at the park revolved around animals that were seen, and navigational or immediate planning issues. Questions arose about various animals in the park. One sign with an unfamiliar name prompted the following question to an observer. "*Do you know what powdermelons are? Is it a collective word for all types of kangaroos and wallabies?"* The backpackers also discussed shopping options, wondering about prices at different locations. "*It might be a lot cheaper to get Laura a koala at the souvenir shop [outside the park] then to get it from here.*"

4.3.6 Boat to City

The boat ride back was reasonably uneventful. The recorded tourist commentary did not occur, except for an announcement about a bat colony and a chance to take photos of the city. Most of the backpackers were tired and slept for portions of the trip back. Discussions occurred only between members of subgroups, and subgroups sat separated from each other (see Figure 13).

Figure 13 : Subgroup A (front) sits away from subgroup B (back), while both privately review photos.

Figure 14: Subgroup A stops to buy postcards as they had planned to do while on the boat.

Subgroup A discussed issues surrounding female beauty, anorexia and bulimia in relation to friends back at home. They also discussed who they were dating, how much money they had left for travelling, and future life plans. They also wondered where a tourist information office was and planned to get postcards and stamps on the way back to the hostel. Subgroup B reviewed photos (see Figure 13), added additional features to their prototypes and chatted in Swedish. BP4 also read a book. Subgroup C talked about problems with a digital camera and some Canadian girls they had met. They also slept for a good portion of the trip back.

4.3.7   Walk to Hostel

Upon leaving the boat, subgroup A proceeded to run a number of errands before their set time to return to the hostel. They first went to a souvenir shop to buy postcards and other gifts, and attempted to buy stamps (see Figure 14). They were informed by the clerk that they didn't have stamps, but that they were available from a newsagent nearby. They then split up; BP6 went to exchange Traveller's Cheques and BP5,7 went to buy yogurt at the same shop they had visited in the morning. After regrouping, they stopped at the newsagent to buy stamps for the postcards. They discussed who to send the postcards to.

> *BP7: Sending postcards to two friends and two home, 4 cards. Sending two postcards to parents; deciding which goes to which. Mom likes cities, so sending the city [postcard] to her.*

One of the postcard recipients was a friend she had met while working in New Zealand and this card required a different stamp. They discussed the need to send postcard "presents" as opposed to e-mail, to certain important friends or family members. The other subgroups headed directly back to the hostel and had to wait for the last group and observer to arrive.

4.4   Technology Usage

A wide variety of different artefacts were used throughout the day. Some of these technologies, such as paper, are decidedly low-tech; however they do affect usage of other higher-tech devices surrounding them. Understanding when electronic devices are used or not, and how other media compete with them is useful for forming product requirements. Throughout the day, backpackers used a variety of objects

including their lunches, apples, magazines, books, journals, jackets, maps, bags and mobile phones. Some of these items are private (e.g. a journal) while others (e.g. a magazine) are public and shared. Some items may cause problems for other objects (e.g. hot coffee and cameras). Items are frequently 'juggled' by travellers, putting important objects in safe locations while handing unimportant objects to others or setting them on the floor. Some of the interactions between backpackers and these artefacts are discussed below.

Backpackers purchased coffee in paper cups, and yogurt was carried in plastic containers. Subgroup A carried two purse-size bags and small backpack; B carried two backpacks and C carried one backpack which they shared. Most of the backpackers had digital cameras, with the exception of BP2 who was using a disposable to avoid damaging his digital camera. The cameras were regularly used for taking pictures, as well as sharing photos with others in the subgroup. Sharing sometimes happened directly after taking the photo. However, it more commonly occurred in more stable settings such as the boat, where a small group could look at photographs easily. Subgroup A discussed and compared minor details, such as the direction the koala was looking in the photographs they had purchased. Sharing often had a social function such as a comparison of guys they had pictures of, to see who was the best looking. A related issue was finding animals in the proper position to capture in a photograph, or seeing animals at all. BP7 spent about five minutes trying to position a kangaroo properly for a group photo.

Figure 15: A prototype is placed in a large jacket pocket, while a magazine rests on her lap and the coffee cup is shared. Coffee could be spilled and her hands are not free to manipulate a device.

Figure 16: Writing a quick outline of the day's events while on the boat, before writing a longer journal entry at the hostel. Paper journals might be used prior to digital journals in the future.

Backpackers regularly commented on their electronic devices without prompting by observers. They discussed problems they had with them, things that should be redesigned and how they chose to use them. Battery life and memory was a common concern.

> BP7: [I could be] taking videos, but afraid it will run out of space. I'm running out of battery on my camera. I really want it to come out. I'm really worried my camera's going to run out any minute.

> [later in the day]

> *BP7: My camera's just died.*

Another conversation related to the quantity of photographs taken and the relation of photographs to travel satisfaction. BP2 Indicated he had taken 180 photos in the last three weeks of travel.

> *BP2: It says delete all images.*
>
> *BP1: That'd be harsh.*
>
> *BP2: That would be horrible!*
>
> *BP1: Back to Sydney we go. [laugh] Take three weeks out of your trip. Why did you take so many pictures?*
>
> *BP2: Apparently [another friend] reckons I haven't taken that many.*
>
> *BP1: 180 pictures in three weeks?*
>
> *BP2: He reckons he's taken 400.*

Several of the backpackers discussed memory card options and CDs. The quote above indicates the growing amount of data backpackers are creating and the importance of recording their travels safely. Some distrusted CDs because of the risk of carrying or mailing them. Backpackers commonly jested about the pictures being the reason for travelling to a location. After completing her koala photo BP7 joked "*OK, we can go home now.*"

Several of the backpackers mentioned travel journals and BP7 wrote regularly in hers. She kept a smaller notepad for keeping track of daily events (see Figure 16), which would help form a larger journal which she kept at the hostel. The larger journal contained clippings and memorabilia from her travels.

On the boat ride back, subgroup A talked about MP3 player requirements. One asked if her mates "*brought any music with them.*" She previously had a mini-disc player which she used while travelling, but it had broken and she wasn't in a position to get it repaired. They indicated that 256 MB of memory was probably too small and that a larger MP3 player would be appropriate.

There were a number of situations where backpackers communicated with remote people outside the study group. BP7 was seen using her phone for SMS several times on the boat, and indicated that she was texting a friend back in England. Several backpackers discussed sending group e-mails, indicating they were "*to those met, home friends, family, [and for] big events.*" BP7 also indicated she had a friend "*e-mailing me expectantly about when she will return.*" BP5 jokingly indicated that "*she's still e-mailing that [John]*'", who was a love interest she had met in New Zealand.

4.5   Effects of Type of Mobility on Group Behaviour

Different environments physically permit, and even encourage certain types of group behaviour. For instance, chairs on the back and sides of the boat deck (see Figure 17) only fit two people. This supported single strangers meeting or couples interacting, but didn't fit the needs of the group of three English girls well (who sat on a bench). This seating arrangement made achieving ideal angles for interaction between groups difficult.

Figure 17: BP2 chooses a seat for himself and BP1 on the boat trip to the park.

Figure 18: BP1 rests two containers on the floor next to his bag. These are impersonal items that aren't kept close to the body.

More stable environments such as the boat or lunch area enabled travellers to set down items and use more of the surrounding space for their needs (see Figure 18). This also occurred while in line for getting koala photos taken, when backpackers didn't want to carry bags. Being able to use public areas for temporary storage of private items reduces the need to physically manage these items.

Socializing while walking to and from the boat was more challenging due to a very high level of change and unpredictability in the environment. There were similar impediments to inter-subgroup interaction at the park, but it was easier to find quieter areas if needed.

Low-change environments (e.g. boat trips, lunch table) tended to facilitate discussions that were more in-depth and concerned the personal lives of participants. Discussions in high-change environments (e.g. walking to and from boat, walking around park) tended to relate more to items in the immediate environment and suffered from frequent distractions. However, the duration of time which participants knew each other also affected the depth of conversations; longer duration tended to produce deeper conversations regardless of location. Another factor was the reason they were in a location. While walking in the mall participants did look at their surroundings, but they *were not there to do so*. In contrast, at the animal park a primary goal was to see as much as possible. This affects how appropriate it is to bring up discussion topics that do not pertain to things immediately being observed.

4.6   Environmental Differences in Study Phases

In the morning there was less foot traffic in the mall. Backpackers had just woken up and two were drinking coffee. Everyone had just met and was getting used to being

observed. It was chilly and several backpackers wore heavier clothing. There was traffic noise and backpackers had to wait for automobile traffic at several intersections along the way.

Temperature changed from cold to hot while waiting on the deck of the boat. A freeway overpass resulted in a great deal of background noise. The boat was reasonably empty when the participants arrived, but rapidly filled up before departure. Once the boat started, a reasonably loud travel commentary began on the boat speakers which made discussion difficult in some cases. When the rain began the temperature dropped, a wind picked up and most passengers moved into the cabin. It was not as loud there, but there were other passengers having discussions in it.

After arriving at the animal park, the rain had stopped and the temperature was warmer. Many other tourists surrounded the backpackers and held conversations. There are many species of birds around the park and these could regularly be heard quite loudly in the trees overhead. Roughly a half hour after arriving it started to rain again. BP1&2, weren't greatly affected, but several of the participants and observers struggled in wind and rain with cameras and notepads. The group lunch session provided a stable environment for participants to set down items and eat.

The boat ride back was not as crowded and did not have the tourist announcements. On the river without traffic noise, it was fairly quiet. The temperature was higher and it did not rain. The walk back to the hostel was busier than before and the backpackers had to squeeze through crowded areas in the mall. They also had to wait for automobile traffic on several occasions.

4.7   Missed Opportunities For Information Exchange

When they signed up for the study, backpackers were asked about places they were going or travel related questions they had. This resulted in 52 responses for the seven backpackers. At the end of the field trip, backpackers reported that 24 of these had been discussed during the day. Consequently, roughly half of these had not been discussed. Examples of unexplored topics include: shopping in Nimbin, going on a sailing trip in the Whitsundays, and riding scooters after kangaroos on Magnetic Island. The large percentage of unanswered questions indicates that backpackers are missing opportunities to get information which they report they would like to know.

While it cannot be presumed that all of the backpackers, observers or other staff during the day had answers to the remaining 28 questions, it is likely that partial answers existed for many of them. For example, backpackers were free to ask observers questions, and collectively the observers were able to answer most of the unanswered questions. This indicates that it isn't always clear who to ask, or perhaps it is not always socially permitted to ask about questions that are of interest.

4.8   Trust Among Backpackers

Backpackers on the field trip discussed travel experiences and gave advice or tips, both to other backpackers and observers. This didn't happen as much as expected due to the low communication levels during the field trip. However, it picked up once backpackers arrived back at the hostel and during the participatory pairing activity.

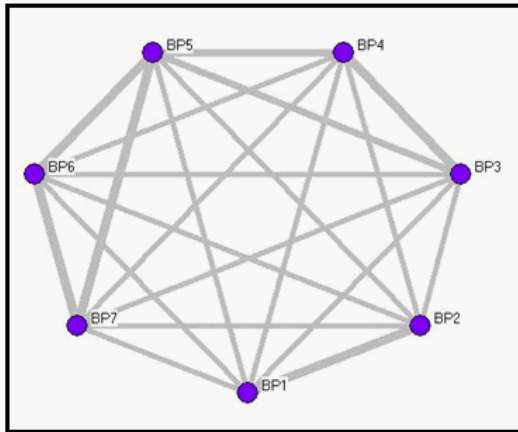**Figure 19: Trust in travel information from other backpackers is reasonably strong before they spend time together.**
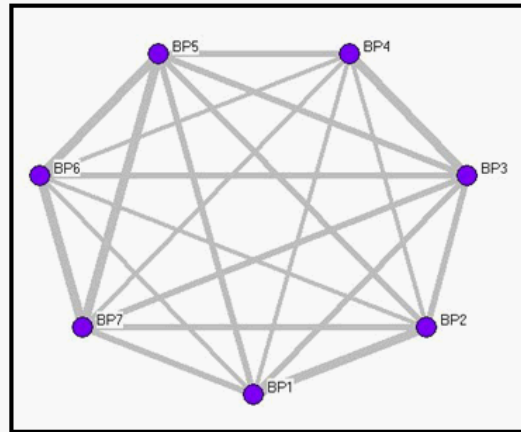
Figure 20: Trust following the field trip remains strong. Backpackers implicitly trust other backpackers information.

As can be seen in the comparison of the before and after ratings of inter-traveller trust (see Figure 19 and Figure 20), backpackers initially trust each other a great deal. The ties have grown slightly after sharing the experience of the field trip and learning a small amount about each other, but these travellers trusted advice from each other when they first met. Backpacker rated trust and other factors on a 5 point scale: 0 (never or very low) to 4 (often or very high) which was used to generate the diagrams.

4.9   Backpacker Feedback About Prototype Designs

Backpackers carried the prototypes with them throughout the day: through the different walking phases and while on the boat or in other stable environments. The prototypes were integrated into the rich collection of other technologies backpackers commonly use.

This section begins with a practical discussion of how the prototype usage as a research method unfolded. This is followed by examples of how the prototypes were used in certain settings and a separate section is given to describe results for each of the prototypes. The section concludes with a discussion of product requirements that resulted from in-situ usage and a discussion of why certain prototypes were not chosen.

4.9.1   How Prototypes Were Used

While at the hostel, most of the backpackers placed their prototypes in backpacks, bags or pockets. They remained there for the walk to the boat, and were not visible during this time. Several participants took their prototypes out on the boat to the park, although many were left in bags. Some backpackers took the prototypes out at the park, to "try them" in different situations. This was further encouraged by the brief workshop held during lunch at the park. More activity with drawing on the foam occurred on the boat ride back, but several of the devices were not altered by backpackers. The walk back to the hostel didn't result in any prototype usage. Early in the study the observers worried that the prototypes were being ignored. Consequently observers occasionally asked participants "how the prototypes were going" which prompted several discussions.

Several backpackers made comments similar to "*I haven't really modified it because I haven't really needed to use it today.*" Even though the device features arose from previous discussions with other backpackers, the need to use a specific feature might only arise during extended use, or in other types of environments. For example, the prototype allowing visualization of the rest of the group was only relevant in one situation where one of BP7's friends wandered out of sight briefly; otherwise the subgroup was always together. One jokingly said "*You two have to get lost so I can ask my device where you are.*" However, there was a situation a day previously when they had all been trying to meet and they thought the device would have been useful.

Similarly to mobile phones or cameras, the prototypes were stored in pocket or backpacks the majority of the day. The devices were removed primarily when a relevant situation for their use arose, or they were reminded by the experimenter to consider situations for using them. One exception was the necklace (see Section 4.9.8) who's owner carried it wrapped around her wrist and in a hand for a portion of the day.

Backpackers were told they could remove the sticky-note descriptions and many of them did. This was partially because they looked tacky and because they fit into pockets more smoothly without them. The prototypes entered into an ecology of other artefacts such as clothing, jewellery, food and digital cameras. The prototypes were also used in a social environment where other backpackers and strangers would see them in use. The backpackers were conscious of how playing with pieces of foam would look, and BP5 explicitly mentioned that she didn't wear the necklace because of its poor aesthetics.

> *BP5: With this fetching foam thing around your neck [holding out neck string of prototype].*
>
> *Interviewer: Which you didn't use the whole day!*
>
> *BP5: Well, I didn't want to walk around with a bit of foam [group laughter]. I would have got some dodgy looks. But if it has a purpose, like a mobile phone.*
>
> *Interviewer: So if I made it a bit prettier?*
>
> *BP5: Ya.*

Consequently the aesthetics of the prototypes and the social environment in which they were used, were relevant to how they were used and experimented with.

The size and shape of the prototypes affected how they were carried. Design 5 (see Section 4.9.7) was carried in a front pants pocket because it fit in easily with other objects carried there. BP5 said the following about his prototype's shape, even though he did not like the fictional functionality it contained.

> *BP5: The shape's good. I liked it, it's small, it's discrete. It fits in the pocket, it's flat. The cut of it feels nice.*
>
> *Interviewer: So it's small enough not to get in the way?*
>
> *BP5: Ya, if you have it in your pocket with your wallet, it sits beside it.*

The tablet-sized device was primarily carried in a backpack. It was envisioned by its user as needing to be carried in a bag to avoid holding it, with a head mounted display in sunglasses as an interaction method (see Figure 21). The necklace (see Section 4.9.8) was small and light and was wrapped around a wrist and carried in a

participant's hand with a digital camera for a while at the park.

Figure 21: Demonstrating a head-mounted display wirelessly connected to the tablet stored behind the body.

Figure 22: Demonstrating signing above the camera mounted in the phone to communicate with deaf friends.

While discussing features of the prototypes in the post-activity workshop, participants often gestured with the device to clarify how it would be used. For instance, BP4 was happy to borrow a pair of sunglasses from an experimenter to demonstrate a head mounted display system he wanted (see Figure 21) and BP3 gestured to indicate how a sign-language communication system would work (see Figure 22).

4.9.2   In-situ Prototype Comments

Observers were always present near backpacker subgroups. A number of conversations with participants about the prototypes occurred, usually when backpackers took them out to mark on them. Most of these discussions occurred on the boat, but several occurred while walking around the park. Several of these exchanges are listed below with brief analysis.

> *BP5: I should draw on mine. Where is mine? I hope I haven't lost it.*

> *[They talk about it looking like a Tomogotchi (Japanese game)].*

> *BP7: I don't really like this idea of this thing only showing me the location of other group members. I want it to tell me everything that a woman in a tourist information office could tell me. I want it to have a mini-internet on it. All the leaflets, directions, opening times, stuff like that. Maybe e-mail as well. Maybe like a mini-walkie talkie. Hello, where are you?*

The backpackers above have practical concerns about using the prototypes. Being relatively small and light makes it possible to lose them. They are uncomfortable with certain features and they use examples from their travel experience (e.g. woman in tourist office, leaflets) as a way to discuss desired functionality. Acting out interaction with the foam is natural and fun for them.

> *Observer: What else could it do?*

BP7: I'd want it to be able to fit into my pocket without getting damaged. I don't want a round screen. The text doesn't fit into a circle. I want a lens cover on it and a camera on the back.

Observer: Why did you carry it in your bag?

BP7: I didn't want bulky pockets in the photo.

In this case, the backpacker has a lot of practical concerns about her device. She is worried about it being too fragile, and about how she can carry it. She's less concerned about the aesthetic appeal of a round screen than the utility of being able to read content that is likely to be in a square layout. She is concerned about scratching the camera lens (a member of their subgroup has a camera with the same problem.) Despite these utilitarian concerns, she doesn't carry the prototype in her pocket because it is slightly too large. It will show through her pocket, making her pants look "bulky" and consequently make her look less attractive in group photos. So social and aesthetic concerns are considered when weighing design options, but in ways specific to the individual.

While in the park BP5 was talking about using her device to "*take pictures of objects around and identify them.*" She said there was a "*lack of information about the kangaroos, so I want that on the information device. I want to put all the park tickets on the digital wallet device.*" This indicates a number of situated problems: identifying objects, getting information about the environment and managing a variety of park tickets, which she has incorporated into the device design.

4.9.3　Design 1: Free Phone

Figure 23: Additional news, weather and hostel comparison features have been added.

Figure 24: The device prototype rests on one knee while she writes a note on another piece of paper. This type of device might be dropped easily.

The motivation behind the "free phone" design was to explore possibilities related to voice-over-IP, mobile Skype and address backpacker complaints about phone cards and communication costs.

BP3, (female, 26-30 years, from Sweden) chose the prototype. She requested a number of new features in addition to the ability to make phone calls. These included a video-telephone, digital camera, translation services and a number of information retrieval services.

The translation service was to automatically translate speech between English and Chinese. They had met a friend travelling who was from China and was currently staying in a nearby town. She also mentioned possible issues of time zone problems if this person returned to China. A related translation request was for the videophone to recognize and transmit sign language.

She requested several information services. "*And then like an information thing. With like news, weather, sales. Like where can I find, in Brisbane. I don't know where they have good sales.*" She wants a simple service with weather forecasts for each city they go through, and a shopping interface for determining where products are available and on sale. She also requested a similar comparative shopping service for hostels to see which is cheapest, or offering special deals.

She drew a screen and typical mobile phone interface, with the addition of buttons for specific functions such as shopping or hostels. Observers didn't note where she carried the device, but she often left it resting on a knee when on the boat. This sometimes occurred while writing on it.
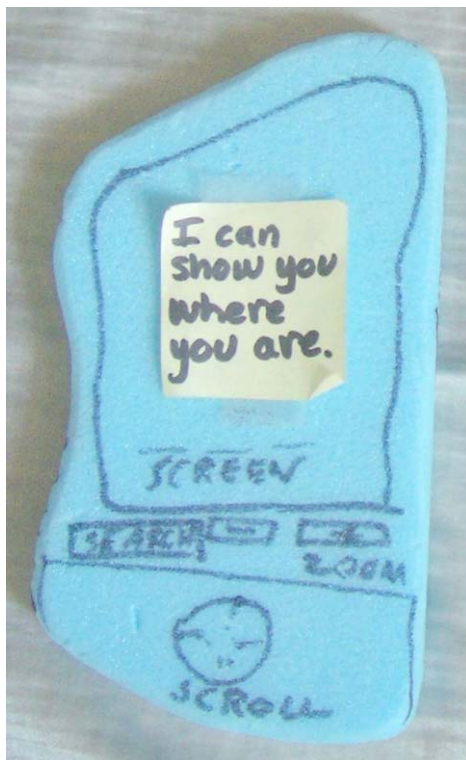
4.9.4 Design 2: Location-aware Tablet

Figure 25: A location sensing tablet computer has had a screen, buttons and a fold-out thumb keyboard added.

Figure 26: Backpackers collaboratively discuss and hold the prototype, discussing possible features. They juggle the device and two apples concurrently.

The motivation behind the device was to explore what type of map interfaces people would request in a device that had GPS or other location tracking technology. Backpackers in MIS-1 had used maps extensively and often had problems locating themselves, paths to objects or desired destinations.

BP4 (male, 26-30 years, from Sweden) chose the prototype. He came up with a wide range of functionality he would like to be included. Most of these ideas were written on the back side of the prototype. They consisted of: contact list, MP3/AM/FM, travel diary, friend finder, sunglasses screen, Internet, camera, mobile phone, and GPS.

He discussed the need to have a general usage device at home, which would also be useful when travelling. He also wants separate types of information which could be downloaded depending on the situation. "*I would find it nice if you could download*

to it, so you could use it at home, school, work." He envisioned this transfer occurring at home or in Internet cafes via a USB connection.

BP4 drew a large screen, navigation joystick, and search, zoom, "*save position [location]*", and WI-FI buttons. He discussed the large size of the device, and the need to carry it in a bag but still be able to access the content. The solution he developed was to have a head mounted display (HMD) in a pair of sunglasses which were wirelessly connected to the main unit. The prototype was primarily carried in a bag during the field trip; however, it was also stored in an oversize pocket and rested on a knee for long periods.

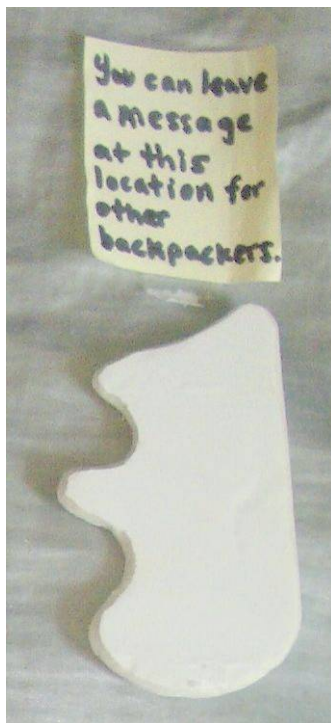### 4.9.5 Design 3: Geo-tagging

Figure 27: The geo-tagging device offered virtual-graffiti functionality.

Figure 28: A participant discusses why he didn't think location tagging would be useful for backpackers.

The motivation behind the device was to explore geo-tagging, which enables saving messages or other data to a location. GPS units and some mobile phones now offer this functionality in various forms. Backpackers in MIS-1 had expressed an interest in hearing other backpackers' comments about travel locations and geo-tagging seemed a likely solution (Cheverst et al., 2000; Lane, 2004).

BP1 (male, under 21 years, from England) chose the prototype. The prototype was not used much and BP1 indicated that he did not understand how the functionality would be used during the lunchtime prototype review. After clarifying the purpose, and likening it to normal graffiti, the prototype still did not see much use.

BP1 indicated that there hadn't been many opportunities to use the device at the animal park where a lot of information was already available. He indicated that it might be useful in other situations.

> *BP5: I'm not sure how many people would make the effort as well, to store information that comes out.*

> *BP7: Sometimes I'm quite lazy.*

> *BP1: I don't think it would work at somewhere like the park. Where all the information is available to you then and there. And if they had a screen, and you put your thing in, and maybe it's in a different language as well.*

This discussion introduced the topic of kiosks and whether information would be more useful at the park or from the hostel and how the device would exchange information with a kiosk. BP1 drew several small items on the back which were a microphone, speaker, activation button and a sensor to connect with an external kiosk.

4.9.6   Design 4: Visualize Group Members

Figure 29: A circular screen and buttons has been added by a backpacker.

Figure 30: A backpacker thinking about potential uses for her device while standing in the middle of a field. Other people, animals, weather and current tasks probably affected what she chose to use it for.

This prototype was intended to explore why backpackers would want to visualize the locations of other people, and who they would want it to track. In MIS-1 there had been situations where backpackers had been distributed and wanted to contact each other.

BP7 (female, under 21, from England) chose the prototype. She indicated that there hadn't been many opportunities to use the device. "*Mine can show the location of*

other group members, which I didn't really use today. But I could see that it could be quite useful, if it worked all over the world, and didn't cost you any more. Like [BP5] and [BP6] have mobiles with them." There was only one occasion where the three girls separated out of sight of each other. This occurred when BP5 left to look at an exhibit a short distance away and a koala the other girls were watching became particularly animated. They called out to BP5, who eventually heard them. In this case the desire to contact and/or find someone is time critical in that the event of interest might end quickly.

In situations where there weren't immediately relevant experiences, the interviewers tried to introduce recent travel history into the discussion. This resulted in the following exchange.

> *Interviewer: In terms of the last week, are there any situations where you've wanted to visualize the movement or location of others?*
>
> *BP7: Ya. People that I've met in one place, that I knew were going to be in the same hostel. I'd want to find out what room they were in, or you know, if we don't have mobiles. [pause] I didn't know what time you two [gestures at BP6,7] were arriving yesterday. You didn't have mobiles. It would have been quite good to find out. I went out yesterday, and I didn't know what time they were going to be back.*
>
> *Interviewer: Is this something you'd use just between the three of you while you're travelling or would you want to include other people you met or people at home?*
>
> *BP5: Umm, more of the sort of wider network like mobiles, where you just add someone on.*
>
> *Interviewer: How would you visualize the group? Would you want the group to just be the three of you, so you could see where you were, or would you like to see the people you met last week in a larger...*
>
> *BP5: I would... I wouldn't want it to be limited, I'd want to be able to add new people.*

It becomes clear through observing usage and this discussion that the backpackers are not interested in visualizing all seven members of the study group. The social bond between her and the unfamiliar backpackers in the study group (BP 1,2,3,4) is not high (see Figure 6, Figure 7); this is particularly true half-way through the study when she is considering usage of the device in-situ. She is interested in tracking her two other friends, and other people such as friends or family that are in other locations. She emphasizes the need to add (and presumably remove) people on a case-by-case basis.

4.9.7 Design 5: Object Identifier

Figure 31: A device for identifying objects in the environment.

Figure 32: Discussing what types of objects would have been identified on the field trip.

The motivation behind the object identifier was to explore how a digital device that was capable of recognizing its environment would be used by a backpacker. This idea resulted from problems backpackers in MIS-1 experienced identifying items at the animal park.

BP2 (male, under 21 years, from England) chose the prototype. He indicated that there hadn't been much use for the device and that it probably wasn't very practical for a backpacker. "*To be honest I didn't mark it because I didn't see much use for it. Personally if I wanted to know, I'd ask a fellow traveller or get some information. I couldn't justify spending money on something you could do other ways.*" He indicated that it often wasn't difficult to find desired information in the environment (e.g. a sign at the park) and that it was often easier to ask someone who knew the answer.

The mention of the cost of the device/service is important. Many of the backpackers were concerned about how expensive services would be and many wanted them to be free. As mentioned previously (see section 4.9.1), BP2 liked the shape and explicitly mentioned that it needed to fit in a pocket with other items that were already carried there. He carried it in his front pants pocket during the field trip.
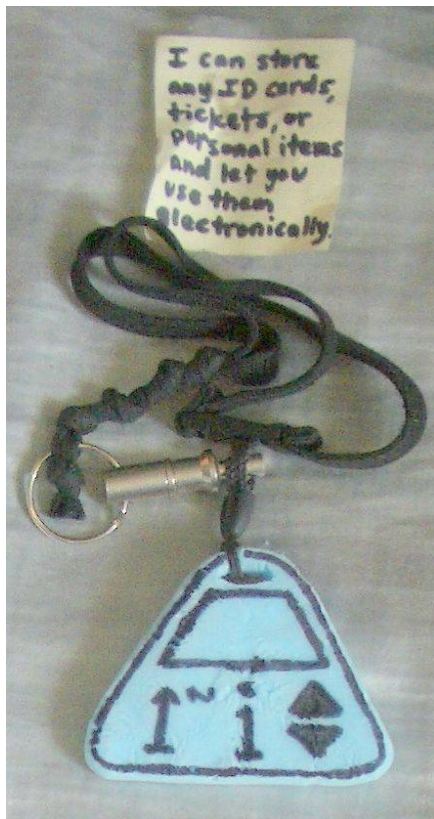
4.9.8 Design 6: Digital Wallet

Figure 33: Information and navigation buttons have been added to the digital wallet.

Figure 34: Resting the device on a boat windowsill to draw interface components. This reflects how a pen-based interface might be used on a small device.

The motivation behind the digital wallet was to investigate developments such as Nokia's Digital Wallet™ and explore problems reported in MIS-1 concerning losing tickets and passports .

BP5 (female, under 21, from England) chose the prototype. She didn't end up using it as a wallet, but borrowed a feature from Design 1, which supporting information queries. The group of girls had a lot of questions about the kangaroos and were unable to find information about them posted in the area. This information was in a small gazebo which they did not find because they ran by it when it started raining.

> BP5: I didn't see any park rangers...
>
> Interviewer: So if you wanted some park information when you were in the roo area, how would you want it to...
>
> BP5: Maybe... OK, having some kind of really obvious point where you go up to, and it [the data] goes into your thing, and then you're able to walk around. And maybe, like these audio tours, that say something when you get to a certain point.
>
> Interviewer: Would you like it to speak to you or would you like to see something on a screen, or...?
>
> BP5: [She glances down at the prototype, apparently imagining a screen]. When you're looking at it, you can't really look around. So, it might be good to

have an ear thing [earpiece]. But the thing is, I like talking to these lot [gestures at friends], about things they would see, and that [gestures at imaginary earpiece] kind of shuts you out of it.

A number of interesting design points arise in this discussion. First, she is considering usage of a hypothetical device in a problematic situation experienced earlier in the day. Second, the idea of an on-site kiosk is introduced. Third, the device is compared to an audio-tour device which the backpacker is familiar with. Additionally, she is clearly able to articulate her social needs for the interface and come up with a potential interaction design proposal. Her comment about discussion rates is clearly shown in the network graph of communication (see Figure 4, Figure 5) showing strong ties between BP4, 5, 6.

This design was the only "wearable" design chosen and was carried differently from the other prototypes. BP5 wrapped the tether around her hand and wrist while walking around the park and held it in her hand. She often balanced it with a camera in the same or opposing hand. She also carried it in a pants pocket. She added a compass pointing North, and information and navigation buttons.

4.9.9   Design 7: Bargain Finder

Figure 35: The triangle shaped prototype was not marked up.

Figure 36: Two prototypes sitting on a lunch table, visible to others and interspersed with food and writing implements. These devices might be dropped or have food spilled on them. They also might be able to exchange information using short-range protocols.

This prototype didn't have any technological motivation, but was a direct response to backpackers in MIS-1 who were obsessed with finding the cheapest travel options.

BP6 (female, under 21, from England) chose the prototype. She repeated the conclusion that there hadn't been any good opportunities to use the functionality during the day. However, when prompted, she discussed recent issues of finding the cost of a greyhound bus ticket and trying to find other inexpensive travel options.

> *Interviewer: Where are you going next, going down to Byron? Is there anything you want to know about what is cheapest there?*
>
> *BP7: Well, we know we have to pay a little bit more for hostels, because of the festival.*
>
> *BP5: We don't have a choice where we're staying. We want to go to Nimbin for a day. But the cheapest way is probably a bus.*
>
> *BP7: We reckon we might do Kayaking up in the Gulf of Deception. But there's more than one company, but we can ask. We were also wondering about Sydney.*
>
> *Interviewer: So you're wondering about kayaking in Byron versus Sydney.*
>
> *BP7: No, I was just thinking general things in Sydney. Would it be cheaper to use busses or the ferry, and the cheapest places to eat.*

This discussion reveals the complexity of cost comparisons for backpackers. Many decisions are based around future locations (e.g. Byron, Sydney). They recognize that cultural events (e.g. festival) will affect pricing and availability. There are cases when choices are available (e.g. kayak companies) and cases where there aren't (e.g. one bus to Nimbin). The bus in this case was very likely to be the cheapest option, without the need to verify it. Relevant issues change for large cities where more options are available and it may be more difficult to get pricing information to compare. Many of these questions are framed by the information that is available. For instance, is the bus the only way to Nimbin, or is hitchhiking commonly practiced there? Without this information backpackers may default to a well known travel method.

4.9.10 Requirements Discussions Resulting From Prototype Discussions

Discussions about a prototype often resulted in comments from participants not directly presenting, and these discussions often took tangents to other types of technology or related product requirements. Several examples are given below; the first relates to availability of communication services while travelling.

> *BP7: It could be quite useful, if it [Design 4] works all over the world and didn't cost you anything. Because like, with mobiles, like I stayed in New Zealand for five months and was using my New Zealand mobile there. If you're only going to be in each country for a short period of time, then using a foreign mobile can be really expensive. If we had something that could work in any country for the same price.*
>
> *Interviewer: You've got a phone here?*
>
> *BP7: I've got my New Zealand mobile here. So, if I call anywhere it's at the overseas rate.*
>
> *Interviewer: So do you use their [nods at travelling companions] phones?*
>
> *BP7: No, I use it [my phone] to text. It doesn't cost any more money to text, but that's because it's a New Zealand mobile [plan].*

Interviewer: So you wouldn't want to buy a SIM card in each place you went. So you'd prefer cheaper SIM cards, or maybe a card that is cheaper when used outside the country?

BP7: I'm just thinking, say if you're going on an around the world trip, and lots of different countries for two weeks at a time. You're not going to get a SIM card, keep it for two weeks and then have to sell it again. Just for two weeks it's not worth it. <pause> I don't know how it would work. Whether you'd buy a set of them.

A number of product requirements are touched on. There is a problem that BP7 is experiencing related to being able to affordably use her mobile while she regularly moves between countries. A solution isn't arrived at in this discussion, but it is clear that a range of different SIM marketing plans or altered product designs could solve the difficulty. She is tacitly requesting either a way to use one SIM card inexpensively wherever she goes, or a way to buy cheaper SIM cards as she travels or in advance. The requirement is inexpensive voice calls from all locations the backpacker travels to.

At several points in the discussion, backpackers introduced the idea of the mobile devices interacting with kiosks. This led to a discussion of what information sources they would want in different locations.

BP5: So you'd have something like a card, with a little screen, and you put your little thing in [makes pushing motion with prototype]. I think it'd work a lot better in the hostel. Like the notice boards on the internet, where you get other people to read it. Having something like that.

Interviewer: OK, so what sort of information would be...

BP5: All the usual categories you see on the websites.

BP7: Like ratings, for all the main things to do, the animal park, or... what else is there to do in Brisbane <group laughs> All the main things.

BP5: We were saying at the animal park today, there wasn't very much information.

BP4: There was about the koalas.

BP5: Ya, but we didn't see very much information about the kangaroos.

BP6: And other backpackers; I'm sure the majority would be right. But it's just their opinion or their knowledge, not necessarily facts. I don't know, if you wants facts, like we were interested in.

Interviewer: So you're saying that there's value to having more official sorts of information?

BP5: In terms of the kangaroo park. In the hostel again it depends on lot of other facts. Lots of things affect your state. Who you meet, the time of day you arrive. Whereas at the koala sanctuary, maybe other backpacker thoughts. <pause> Maybe a frequently asked questions would be a good thing. Cus a lot of us have the same ideas.

Interviewer: So you want a frequently asked questions for a location?

BP5: ya

Requirements coming from this discussion relate to location and type of information desired. Some information was wanted at the park, concerning the kangaroos. However, the backpackers aren't particularly interested in other travellers' opinions

about the kangaroos. They express concern over backpackers who would offer extreme comments. So the ability to check reputation and collective visitor opinion are requirements. The ability to access some types of information on-site is also a requirement.

> Interviewer: So if there was some sort of kiosk thing in the hostel here [gestures behind him at door] that allowed you to say, write things about the animal park, or about what you thought about going on the boat cruise. Is that the type of thing where you'd type stuff in for other backpackers, or does that sound like too much work?

> BP5: Well I don't know, if it was at the animal park. And all these different little kiosks; I don't know that I could be arsed to do it. But if it's just in your hostel. You are based here. You are around here, doing your Internet [gestures to other room]. People do write these things.

> BP7: If it's quite simple, if it's quite quick. Like just 4 questions, yes, no. Like say [if the form question was] was it worth the cost?

> BP5: That would be more negative, there might be two ends of the spectrum. You had a really shit day...

> Interviewer: So maybe it's more important to be able to get that information from here at the hostel then necessarily at the site? Like if you were out in the kangaroo field would you like to see what other people said about the kangaroos there, or what the staff said?

> BP5: More like the staff.

> BP6: You're interested in what other people thought who visited. But you're interested before you go, not after you get there.

> BP7: But what you just said, when people get asked about questionnaires, they often have extremes. They either had a problem, or they really loved it.

> Interviewer: So maybe you need a way to sort of get consensus?

> BP7: You'd have to make people fill it out.

The backpackers come to a number of conclusions about the hypothetical design in this exchange. They indicate that a kiosk at the hostel would have to be highly usable and quick to encourage usage. They are interested in backpackers' opinions about the park when they are at the hostel, but not when they get to the park. Upon arriving they are looking for official (or expert) information from the park staff about more specific topics. They also reiterate the concern about extreme opinions and infer the need for a way to quickly judge collective traveller opinion about a location.
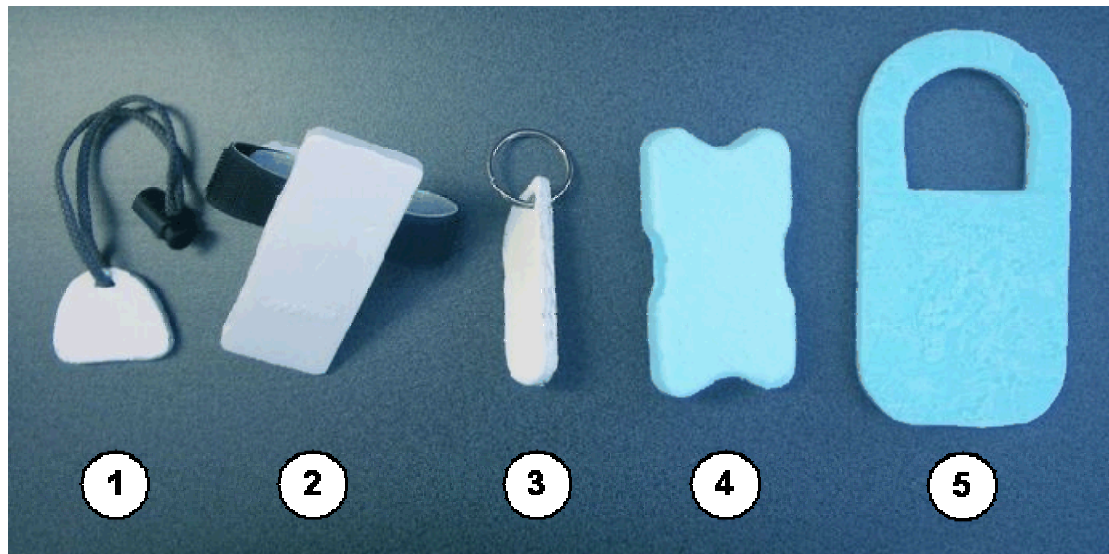
4.9.11 Prototypes That Were Not Chosen

Figure 37: Five prototypes were not chosen by participants.

The five prototypes above were not chosen by participants. The functions and form factors for these prototypes were:

1. *I can find any object for you.* A small pendant hung on a bracelet with a tightening fastener.

2. *I can find someone who wants to buy something you have.* A large watch interface with Velcro wrist-strap and a second small panel on reverse.

3. *I can tell people whom you choose what you are doing now.* Key fob style similar to USB drives.

4. *I can tell you what other backpackers thought about something.* Similar to small mobile phone, with a wide hole through the middle.

5. *Ask me where to find people who know about something.* Shape of a large padlock, but fairly thin.

Participants were not questioned about why they didn't choose particular form factors or functions, and due to the small group of participants it is difficult to find trends in prototypes selected. However, it is notable that only one of the "wearable" designs (the necklace) was chosen, and three of the other wearable designs (see 1, 2, 3 of Figure 37) were not. Several of the devices that were not chosen were very small and would have unfamiliar interaction methods.

The majority of the unwanted prototypes concerned more complex social functionality not commonly found in modern technologies. It is also worth noting that the backpackers chose from the functions after only a few minutes of consideration and did not have a clear idea of what they would be doing that day.

4.10 Arranged Social Pairings of Backpackers

In the second workshop at the hostel, backpackers were each given a card with three pairings about locations or activities they should discuss with others in the group. These pairings were based on form data from the previous day. Pairings focused on Past ⇨ Future or Past ⇦⇨ Past pairings based on the results from MIS-1. Between the seven backpackers, 21 social pairings were identified by researchers and 18 of these were actually discussed by participants. 6 out of 18 of the pairings had already been discussed during the field trip, while the remaining 12 had not yet been discussed.

Figure 38: A pairing card given to a backpacker and completed during discussions with other backpackers they were paired with.

Both previously discussed topics and new topics had a wide range of ratings from useful to not useful. Apparently being able to talk more about a topic that had already been discussed didn't change the utility of the conversation. BP1 and BP2 were the only backpackers headed North, with the other five were headed South. This resulted in a bottleneck for pairing, with BP1,2 as hubs in the network, since they had all the travel information the others would want.

The three Past ⇦⇨ Past pairings chosen by researchers received very poor usefulness ratings from backpackers with an average of 1.3. The twelve Past ⇨ Future pairings received much higher usefulness ratings with an average of 3.75 and four of these were considered "highly useful".

Three bi-directional (reciprocal) pairings were made. For example, BP3 knew about tours on Fraser Island where BP2 was going and BP2 knew about sightseeing in Sydney where BP3 was going.

4.11 Utility of Research Methods

In addition to observing backpacker behaviour, the MIS-2 study was intended to investigate use of situated methods in the context of mobile group activities. In this section we reflect on the utility of these methods based on our experiences using them with backpackers. The section begins with a discussion of the use of 'field trips' as an activity to engage with ethnographic methods. Then the use of multiple observers, note-taking, cameras, and audio recording is reviewed. The section ends with a discourse on the use of low-fidelity prototypes and participatory social activities for design.

4.11.1 Field Trips For Groups of Participants

Arranging group activities is always challenging due to the number of variables involved. This study required pre-arrangements with the hostel, boat cruise operators and the animal park media liaisons. Getting all members of groups to comprehensively fill out forms was challenging, because some were conducted by hostel staff, and because observers had to check multiple forms quickly when they were finished.

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.

There is a balance between safety and allowing for the unexpected in group activities. The activities in this study may have been guided too much, and consequently didn't provide many opportunities for problems to arise that necessitated device usage. However the activities did provide ample opportunity for group discussion, which was the primary purpose of the study. Less controlled activities may result in more interesting results for prototype evaluations.

4.11.2 Multiple Observers

Three observers accompanied the backpackers throughout the introductory workshop, field trip and the post-study workshop. Travelling subgroups within the seven participants were identified the night before via the signup forms, and an observer was assigned to each subgroup. Based on previous results, we presumed that each of the subgroup members would primarily stay in close proximity to each other. Observers were instructed to deviate from following their subgroup only in the event that two subgroups merged and one of their subgroup left the others who were already being observed. This did not occur.

While written notes are important, and not being able to write down design ideas while observing would be frustrating, the primary utility of the observer is to take pictures and directly experience the situation. Pictures implicitly record the locations of the participants at certain times and place audio recorders in a richer context. As expected, the subgroups separated and formed a distributed research group This occurred in the animal park, while walking in the mall, and to some extent on the

boat. Tracking the locations and corresponding situations that three subgroups experienced required three observers. It was very useful for the primary researcher in this study to also be one of the observers. Many aspects of the data from notes, pictures or audio transcripts only made sense because of the experience of having "been there" with the backpackers.

4.11.3 Note-taking

Note-taking produces a large number of observations about backpackers' behaviour and surrounding environmental issues. Writing while walking, and in this case in the rain, is very challenging. Writing frequent notes on a notepad is very tedious and somewhat distracting for participants. One participant wanted to know what was being written, and many of the participants laughed at what they presumed we were writing down or taking pictures of. The act of holding a notepad and writing embodies a distinct posture and arm movements which are easy to notice. More discrete methods of note-taking and possibly taking less thorough notes might be appropriate.

Notes primarily served as a high level index of important events and peripheral design or methodological ideas prompted by observations. Writing about participant movement or environmental events was most important. Writing about backpackers' discussion topics duplicates what is captured more accurately on audio recorders. One observer with more ethnographic experience took many more notes than the other two observers with different backgrounds. Expecting observers without ethnographic experience to take detailed notes for long periods may be impractical.

4.11.4 Digital Cameras

The number of photos taken for the field trip by each observer was 183, 125, and 69 respectively. These were primarily taken when "interesting" events happened, but also on a regular basis simply to record the progress of the study. We had used video for the same study structure previously (Axup & Viller, 2005d) and elected to use only digital cameras in MIS-2. The photos amply summarized the day's activities and captured most situations which became sections in this report. Digital cameras attracted less attention, both from the participants and other tourists, than note-taking or video did. This is primarily due to avoiding the use of a flash and the prevalence of camera use among tourists. Video was used with success to record the prototype presentations at the hostel, although an external microphone is recommended.

Photographs taken during the study can easily be reviewed in sequential order and thumbnails provide a rapid method of scanning an entire day's activities. While analysing the data it became necessary to check details such as seating positions or objects backpackers were holding. Scanning thumbnails provided a rapid way to check these facts. While we did not use pictures as a review mechanism to prompt backpackers' recollections of the day's events, it would be simple to do this. It has been used with success in a previous study (Axup & Viller, 2005b).

4.11.5 Audio Recorders

Three digital audio recorders with external lapel microphones were used in the study. They are lightweight plastic, pocket-size and are roughly $200 (AUS) apiece. They can record for a minimum of ten hours and longer in some modes. We asked for a volunteer from each subgroup to wear them, under the assumption that volunteers were naturally more extroverted and talkative.

The subgroups in the study were even more cohesive than we expected, and there was almost always a recorder amongst a pair that was talking. Audio quality is reasonable in environments with moderate noise or where those speaking are close together. In situations where the recorded participant is near a boat motor, under an announcement speaker or next to a freeway, it can be hard to hear the conversational partner. One pair of Swedish backpackers spoke Swedish amongst themselves in the morning. Even after being asked to speak English for the benefit of the microphone, they continued to speak Swedish for the remainder of the study. This is a risk of watching natural behaviour of non-native English speakers.

We obtained roughly 8.5 hours of audio for each recorder, resulting in 25.5 hours. The audio often has multiple simultaneous speakers, background noise and participants are different distances from the microphone. Consequently automated transcription is currently not an option. One of the recordings was transcribed (not word-for-word) and the other two recordings were skimmed and reviewed for specific situations of interest. Reviewing this quantity of audio is a laborious and time-consuming process. It does however provide a great deal of insight into participant behaviour and records many conversations held out of hearing of observers. The audio transcripts provided the primary data source for this study.

4.11.6 Prototype Use in the Wild

The MIS-2 study structure has risks relating to who gets what prototype, whether opportunities for its use arise, and whether participants understand the potential of the functionality. There is also potential to miss evaluating additional design concepts, such as the five designs that were not chosen in this study. An additional risk relates to backpackers forgetting to think about the prototype. Many mobile devices such as phones are primarily used only if they are needed, or alert the user to a message. The prototypes can be similarly ignored if they don't draw attention to themselves or the observer doesn't remind participants.

The prototypes get used similarly to other backpacker equipment. Consequently, they need to be sturdy, fit smoothly into pockets and preferably look nice enough to not be embarrassing for participants. Marking on the devices was difficult while participants were walking but worked fine on the boat or other low-change environments.

Another, perhaps obvious point is that the prototypes *did not work*, since they were foam. This produced some interesting situations with backpackers. BP7 talked into her foam saying "*Where is [BP6]*" and made a confused look. "*My piece of foam isn't working too well.*" she said to an experimenter. Then BP6 stepped out the door and BP7 said "*I asked it where you were, and you appeared!*" Later at the park they said "*We're not impressed with our foam guidebooks, Sir. The functionality. It's not helping us look at this thing [reptile] in here.*" While all of this was in jest, it reflects two things. Firstly, that people are very capable of play acting with foam and envisioning interaction with it. Second, that it can be problematic for participants to not be able to realistically use features. Paradoxically it is difficult to determine which features to implement to a higher-fidelity, without first seeing users trying to make it work in foam. The same problem was found in the pilot study where designers commented on asking their foam to do things, "*but apparently it was broken.*"

During the pilot of the prototype presentations with HCI students, a slightly different result occurred. Instead of borrowing others functionality, the designers found ways for their devices to interact. For instance, the "group visualization" device needed to interact with the "I can tell other people what you're doing now" device, to be able to

enable them to meet up. This type of interoperability of product ideas was not observed during the backpacker study.

4.11.7 Backpacker Prototype Presentations

The short "trial run" of the prototype presentations held at lunch in the animal park served to prepare backpackers for what would be expected later at the hostel. It also identified misunderstandings about the features and reminded the backpackers to consider the prototypes.

The pairing of the field trip with contextual interviews focusing on the prototypes worked well. Participants had a common, shared experience which they could draw on when discussing how devices would be used. Backpackers seemed at ease with presenting their prototypes in the relaxed hostel environment and focus group style of interaction. Several times the hostel itself entered the conversation and backpackers gestured towards the portion of the hostel where the relevant services were offered.

Doing all the presentations in a group setting as opposed to individually, provided the opportunity for other backpackers to comment on functionality they hadn't been using during the day. There were several cases of "right functionality, wrong person". This was where the backpacker who chose a product didn't find anything to use it for, but others in the group would have.

One participant mentioned that "*I also wanted the whole 'cheapest way to do something' one [Design 7], but she [BP6] got that one.*" However in these cases, other backpackers often borrowed the desired functionality for their own devices (e.g. information queries for the digital wallet) or commented on potential uses of others' devices during the presentations. Consequently the group structure of seeing other people using devices and collaboratively discussing potential functionality was critical for supporting creativity of design generation by backpackers.

4.11.8 Participatory Social Pairing Activity

The social pairing activity was more complex to orchestrate than expected. It took two researchers who had been provided with a pairing process and supporting worksheets, roughly two hours to complete. The seven backpackers each listed five past locations, five future locations and five travel questions. For the case of Past ⇨ Future pairings, any backpacker's five past locations could be associated with the other 60 future and question answers of the other backpackers. This resulted in a theoretical upper bound of 350 bi-directional connections. There would be more possibilities if directionality was considered, but an experimenter could easily spot connections in either direction. Practically speaking, many pairings were not close to being compatible, but still needed to be considered by the experimenter. The pairing process first identified all past locations and allowed rapid scanning of matches from the future or question sections (see Figure 39). This allowed rapid scanning of larger data sets.

Figure 39: Two completed pairing charts used by experimenters to match participants. Seven in total were used; location information (left) detached directly from the original forms. Columns are pre-arranged for Past ⇔ Past and Past ⇨ Future pairings.

An added complication is that the pairings contain cultural, geographical and semantic information. For instance, a researcher looking to make a pairing for a backpacker wanting to know about scuba diving, would need to know which Australian coastal cities were near good dive sites. An additional variable was direction of travel. Backpackers who travel North on the East coast of Australia, are more likely to have compatible pairings with those travelling South, and vice-versa. Furthermore the researcher had to be aware of who was travelling together. Everyone in a travelling group would already know similar information and there would be little utility in discussing the topic. Consequently promoting diversity amongst backpacker pairings would be likely to increase diversity of corresponding travel information and expected utility of pairings.

In some cases, there were no clear connections to be made and researchers had to guess at possible connections. Strategies for this included making connections at a higher level (e.g. a state instead of a city) or guessing at possible locations for activities. One researcher commented that doing the pairing felt like an algorithmic process and that it should be automated.

5   Discussion

5.1   Differences in Results Between MIS-1 & MIS-2

For an overview of MIS-1 please see the related project summary document (Axup & Viller, 2005d). The planned activities for both studies were very similar, with the exception of the introduction of prototypes and the short lunch meeting at the animal park. The seventh person added more complexity to group interactions in MIS-2. In

MIS-1 there were two strong pre-existing subgroups and one pair that had met the previous day. In MIS-2 there were three strong pre-existing subgroups. Additionally, the older couple in MIS-1 consisted of two fairly outgoing people, while the older couple in MIS-2 was more reserved and private. Additionally one of the weak pair (that had just met) was very extroverted and talkative, whereas the corresponding couple in MIS-2 were a bit shy.

There was considerably more intra-subgroup communication in MIS-1 and many more travel related topics were discussed. It also seemed to be more enjoyable for MIS-1 participants in that they laughed a great deal and learned a lot from each other. The observers were surprised to see the MIS-2 participants not taking the same opportunities for social interaction that the MIS-1 participants had taken. The increased amount of intra-subgroup communication in MIS-2 led to very personal discussions between people who had known each other for years. This did not happen much in MIS-1 as conversations were often between new acquaintances who had to start with basic questions and topics.

In MIS-1 there were many surprises for the experimenters. The long wait on the boat was not expected. The boat's recorded travel commentary was unanticipated. The pre-existing subgroups splitting up at the park was not predicted. All of this was expected for MIS-2 and happened in a very similar fashion.

5.2   Similarities in Results Between MIS-1 & MIS-2

Coincidentally, it rained on the boat ride to the park both times the study was run. This is despite the studies being run months apart and rain not being overly common. In both cases some participants rapidly moved from the upper deck to the lower. In MIS-1 some of them remained upstairs under the roof and talked. The bad weather became a conversation topic in both studies.

Behaviour at the park was very similar between both studies. Subgroups broke off based on their predefined ties and the groups distributed themselves throughout the park. Koala photos were very popular in both studies, and backpackers commented on it being the purpose of their trip to Australia in both cases. Sharing of photos after returning to the boat happened in both cases, but in MIS-2 this only happened within subgroups.

The change in discussion topics because of location was similar. More abstract topics concerning travel and personal histories were discussed while walking and on the boat, and topics turned to more immediate objects and goals when at the park.

5.3   Effect of Introduction of Prototypes

The prototypes seemed to add a bit of fun to the initial workshop. Participants had to choose a prototype and were playing with them to figure out how to carry them. Some participants were immediately mimicking talking into their devices.

The prototypes didn't affect behaviour during the walk to or from the boat. This was primarily because they were concerned with other matters, and looking at the prototype while walking is difficult. The prototypes started appearing during the boat ride to the park. They were also used at various stages during the park visit. Sometimes the presence of an observer was enough to remind backpackers to think about their devices, however, it became clear on the boat that it was likely they would be ignored. Thereafter the observers made a point of occasionally asking how the prototype development was coming along.

Behaviour between MIS-1 and MIS-2 was similar and there were no obvious cases of prototypes changing how people broadly acted. It seems unlikely that the prototypes were related to the lower inter-subgroup interaction in MIS-2. In contrast, the prototypes did occasionally prompt discussion topics within subgroups. There was a large amount of unused time on the boat rides and the prototypes appeared to relieve some of the boredom of the trip. Backpackers did take out the devices in situations where they otherwise would not have.

Another additional effect was carrying the prototypes. Some backpackers put it in a pocket, but most carried it in a bag. In either case, it fit in with other items the backpackers carried and interacted with them.

5.4   Why Did the Groups Behave Differently?

Several variables in the study were held constant between the first and second iteration. It is most likely that it was the personality types of the participants and the resulting synergy between group members which resulted in different conversation patterns. Backpackers in MIS-1 overcame obstacles such as poorly arranged seats or heavy pedestrian traffic in the mall to carry on conversations with participants outside their pre-existing pairs. In MIS-2 the same impediments existed and contributed to a less sociable atmosphere.

Backpackers in MIS-2 mentioned that they wanted more opportunities to get to know each other and surveys indicated that they missed many opportunities to exchange information. This seems to indicate that in certain circumstances, groups of people will end up together who are unable to initiate social interaction that they desire and which they would benefit from. This can happen in a similar environment to that which did not hinder social interaction in other groups. Perhaps these backpackers would benefit from a social pairing system that gave them excuses to initiate conversation or found mutually interesting topics?

5.5   Recommended Improvements and Research Method Structure

The methods used worked reasonably well for our purposes, but we take an iterative approach to both method and software design. Consequently we look for improvements and modifications during each cycle of the study. The following are recommendations for improvement.

5.5.1   General Study Design and Methods For Mobile Groups

A variety of methods were used in MIS-1, in part to test their utility for studying collocated and distributed mobile groups. Changes were made to these methods and then evaluated in MIS-2. Reflecting on both studies, we offer the following general recommendations for future studies of mobile groups.

1. **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, cameras attract less attention in many environments and offer a reasonable level of visual detail.

2. **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. Consequently giving one microphone per subgroup and preferably to a female in each subgroup may be more effective. However,

transcribing audio is very time-consuming. Using automatic transcription (if it becomes available) or selective listening to critical periods is recommended.

3. **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.

4. **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. Consider mobile digital entry systems that are more discrete.

5. **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 use and future design.

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

7. **Explore mobile prototype use in near-natural settings**. Out in "the wild" 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.

8. **Make interventions after observing first**. We conducted a reasonably naturalistic observation in MIS-1. This enabled us to see what some of 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.

9. **Observers shouldn't 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.

5.5.2   Prototype Usage and Presentation

The structure of the study depends a great deal on the experimental aims as well as the participants and environment. Consequently these recommendations are best suited for our own research interests, but may be applicable elsewhere in modified form.

Allowing backpackers to select their own prototype from a larger group of prototypes has advantages and disadvantages. We like the idea of seeing which features or form factors are not chosen, and would like to do more to investigate why certain prototypes are not chosen. It may also be beneficial to give backpackers a better way to understand the proposed functionality before choosing. This could happen through a short demonstration of each prototype, or a short video of each prototype being used by actors in a real environment.

It may be useful to encourage usage of multiple fictional features and increased group interaction between the prototypes. This could be accomplished by telling backpackers their device is paired with another device, or by giving each prototype a range of available functions to pick from as needed.

Occasionally, participants wanted their pieces of foam to actually perform certain functions. In particular, communication devices that couldn't communicate made it more difficult for participants to act out using the device. Wizard of Oz techniques have been used to give prototypes the appearance of more advanced functionality (Dahlbäck, Jönsson, & Ahrenberg, 1993; Molin, 2004) but may be challenging to use for mobile or group interfaces. We intend to explore the use of SMS, GPRS, instant messaging and push-to-talk as mechanisms for prototyping advanced mobile, group communication functionality in foam prototypes. Another possibility is simple LCD screens imbedded in prototypes constructed by a 3D printer.

5.5.3 Finding the Right Level of Structure

As mentioned in the method section (see Section 3), it is a challenge to provide a sufficient level of scaffolding for users so that they can contribute, but not so much that they are overly directed. As has been discovered elsewhere (Brandt, 2005b), users will respond to the type of materials they are given. A piece of foam will draw comments about shape, weight and possible functions. Similarly, a plastic device with working buttons and screen will draw comments about button labels and screen interfaces. With the help of various prototyping tools or Wizard of Oz techniques (Dow et al., 2005) it is often possible to choose the level of prototype fidelity. Prototypes used in early stages seek to explore basic requirements and usage issues. Prototypes used later seek to evaluate more specific design concepts that have already proved their worth in earlier evaluation settings.

So what do we want our participants to concentrate on in an early study of mobile group communication devices? During design of this study and the subsequent running of it, we noticed a number of issues that would affect how the prototype is perceived and used by participants (see Table 1).

Table 1: Methodological Issues Affecting Prototype Evaluations

Prototype Issue	Example from MIS-2 (rated High, Medium, Low)
Level of interaction supported	
How much detail is provided which directs how users interact with the prototype?	**Low:** We chose not to provide buttons or screens drawn onto the foam. Participants could handle the objects and move them. They could also add these features.
Level of visual finish	
How "final" does the product look?	**Low:** We wanted simple objects which participants would feel comfortable modifying. We received feedback that some of them looked too ugly to wear in public.
Level of predefining functions	

Has the purpose and capabilities of the prototype been conveyed to the user?	**Low:** We provided users with a high-level description of a function, but allowed them to add new ones as desired.

Level of functional detail

Has the method of performing functions (e.g. steps) been conveyed to the user or restricted?	**Low:** We provided no guidance as to how or where functions should be used.

Level of ecological validity (physical, social, activity)

How realistic is the context or environment where the study is taking place?	**High:** With the exception of observers and recording equipment, and minor directions, the environment was typical for this type of activity.

Level of ecological generality (physical, social, activity)

How typical or easily generalised is the context or environment where the study is taking place?	**Medium:** Backpackers do many other types of activities, however many do involve group transit, walking and park visits. This study is partially able to be generalized.

Level of naturalness of providing feedback

How much does the method of conveying feedback about the prototype to the experimenter distract them from normal usage?	**Medium:** Feedback provided to other participants was recorded and was very natural. Play-acting with the device to demonstrate usage was reasonably natural and was done in locations where it was relevant and socially acceptable.

Changing the level of any of these aspects would have had some effect on how backpackers perceived it. For example, we could have not provided functionality descriptions to backpackers. This would probably have left many backpackers unclear concerning what the device could be used for; it probably would have resulted in backpackers suggesting features already commonly available on other types of products. Another example which we possibly did not get right was the level of visual finish. The handheld items and those carried by men were not an issue. But wearable designs, and prototypes carried by women received feedback that they were too ugly to wear in public. Due to the high ecological validity, these women felt embarrassed to wear them. This is a good example of trade-offs in study design. The value of one variable may affect how other variables should be set.

The majority of feedback about the MIS-2 prototypes was at the level of basic functions that were desired, situations they would use them in, and requirements they had for them. For example one backpacker discussed a desire to use the device to call her friend over to view a koala on short notice. Thus the interface was not designed, but the requirements for it were partially specified. Some backpackers (after some prompting) did draw interfaces on the foam prototypes with foam. However, many of them felt uncomfortable with this and several did not do it. Backpackers that drew interfaces designed input and output methods that were highly unlikely to work. Many of the new features they added were from existing products they were familiar with.

It is always difficult to justify claims about the quality of design ideas. However, it was clear that the interface designs backpackers produced were not particularly original and had usability issues. In retrospect, asking backpackers who were not trained in design to create mobile product interfaces was a mistake. Additionally, asking backpackers to do an unfamiliar task (design) reduced the ecological validity of the

activities they would normally be doing. Requesting that backpackers write a list of functions or situations on the prototype (which some did) would probably have been a reasonable compromise.

We can not offer any general rules about how these issues should be dealt with because every study has a different purpose, stage and situation. However, it seems likely that ecological validity and generality should be very high in early exploratory stages of research to catch high-level problems and usage issues. It may be more efficient to de-emphasize ecological concerns and focus on higher levels of interaction, visual finish and functional detail later in the development cycle.

5.5.4 Participatory Social Pairing Activities

The pairing exercises, which matched backpackers with others to talk to, were an extremely effective and inexpensive way to probe design issues for pairing systems. They are however more complex than they look. The organizational overhead for doing the matching is high and takes experienced researchers. It was significantly more complex for seven participants than six, and recent travel movement of participants adds complexity to the pairing task. There is always a risk that the information one backpacker wants is simply not available in the knowledge capital of the study group. Consequently it would seem beneficial to run the activity with more participants, possibly 30 or more.

The task of developing pairings quickly for this many possible ties would require automation. As mentioned in section 4.11.8, the ties often require semantic and cultural knowledge, as well as varying levels of specificity. It may be possible to automate simple pairings via keyword matching, or use of more advanced pattern matching techniques for more complex pairings. This is an area for future research.

5.5.5 Ethnographic Data Collection and Analysis

The amount of data resulting from three full-day audio recordings, three observer accounts, regular digital camera photos, seven copies of three types of forms and various other data, present an aggregation and analysis problem. This is a common problem for team research projects (Lofland & Lofland, 1995). All data eventually needs to be entered into a digital format. There are also issues related to resolution of data. For example, word-for-word transcription of all audio data would be an unnecessary level of detail, while a brief observational account of the day's discussions is too high level. Design team members would want to see details for certain aspects of the report, but a comprehensive report would be too large for practical use.

Figure 40: A device that would permit digital text entry while walking.

A possible solution involves a combination of all-digital entry, multimedia, database integration and dynamic report generation. Keyboards which permit typing while walking are available[5] and could be integrated with a mobile display to enable typing (see Figure 40 for a non-functional prototype). A spreadsheet installed on a PDA could provide automatic time-stamping of observations. Time-stamping already occurs on digital photographs and most digital audio recordings. Integration of all data into a database would allow a dynamic report format, such as a scripted web page to access selected portions of data on demand. Integration with sound editing software could allow requests for selected excerpts of audio data, for specific design situations where a high level of detail was needed. Additional interfaces could enable comparison of multiple observer viewpoints, organized temporally (see Figure 41)[6]. This was demonstrated to be effective in a previous study which used three observers and needed to compare simultaneous behaviour of different participants (Axup, Viller, & Bidwell, 2005; Bidwell & Axup, 2005).

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[5] see www.handykey.com/, www.frogpad.com/

[6] This research was funded by Charles Darwin University and Dr. Nicola J. Bidwell.

Time	Member A	Member B	Member C
12:41:36			
12:54:08			
13:08:59			Member C says: Ok im right lets go
13:09:30			
13:09:32			
13:09:52	Member A says: Triangles r marvelous. I like isosoles. They have 3 equal sides. Each point is the same distant from its centre. I'm @ palmo uni. WRU?		
13:10:50			Member C says: Ok does everyone know where?
13:10:52			

Figure 41: A web-based interface comparing multiple observer viewpoints and participant discussion organized by time.

5.6   Situations of Consequence: Design Issues

It is a common critique that given a sufficiently biased perspective, everything can be viewed as a problem, a usability issue or as an improvement (Jonas, 1993). Bearing this in mind, we do propose that certain situations in backpackers' lives have more design relevance than others, and that many backpackers actually desire improved tools for these situations.

We have found that these situations of consequence can roughly be described in the following ways: questions, problems, fun, desire, intent and common occurrences. Questions show a need for information; problems are difficulties backpackers experience; fun marks enjoyable situations; desire shows what would bring pleasure; intent shows a wish to do something; common occurrences indicate what will often be useful. It is notable that we had trouble finding requirements or product ideas in the portions of the data that did not fall under these categories.

Discovering these types of design issues while watching and talking with backpackers is not difficult. We recorded at least 184 observations falling into the above categories in this study. We briefly describe some of them below.

Questions: One backpacker asked about the historical significance of the casino building as we walked by it to the boat. Other participants asked about the cost of

skydiving in different locations, what species of kangaroo a smaller variety were and the cost of property along the river. These are all questions which have answers and which the observers found difficult to answer. They all represent opportunities for an information device to provide answers.

Problems: Backpackers travelling to Byron had spent $60 for accommodation for two nights during a festival period. They wondered if it was a reasonable rate given the circumstances. One backpacker had the battery in her camera die before she finished taking pictures for the day. Another problematic conversation centred around comparing values in Australian versus English currencies. These all represent situations where the correct information or tool would improve the backpackers' situation.

Fun: One pair of backpacker discussed whether Australian sheep would be able to understand English sheep. What do sheep communicate anyway? Other backpackers joked about a sign warning people that it was dangerous to get into the crocodile enclosure. Another giggled about a sign indicating that a frog was a traditional treatment for herpes. These seem like individual examples of humour or personal jokes, but they get laughs from backpackers. The opportunity to share them with a wider audience might make them even more funny or enjoyable to travellers.

Desire: One backpacker said he wanted to take pictures of everything he saw. Another wanted to know where she could buy a specific brand of jeans and where clothing outlets were located. Another wished her Koala was looking at the camera in her photo. Subgroup A collectively drooled over a chocolate store on the walk back to the hostel. Providing easier, cheaper access to these desires might have some negative consequences, but most of the backpackers we interviewed would appreciate them.

Intent: Backpackers often discuss plans for the near future or intentions to do things. This included a plan to get yogurt, another to get stamps, and longer term goals of climbing the Harbour Bridge in Sydney or going scuba diving North of Brisbane. These are things which travellers want to do, and any information that can help them do it cheaper, easier or more enjoyably will be welcomed by them.

Common Occurrences: While many situations seem mundane, they represent the frequent, practical necessities of backpacking. These include such examples as finding a toilet, cheap food or the cheapest way from point A to B. They are visible in observations and making them easier would improve a daily ritual of the backpacker.

5.7 General Requirements

It is strongly recommended that the following general needs of backpackers be supported in travel products designed for them. These will necessarily change depending on the type of product being designed.

1. **Typical daily necessities.** Help them find toilets, hostels, cheap food, travel gear, clothing, nearby tourist sites, entertainment, places that sell stamps, postcards, post offices, etc.

2. **Money management.** Backpackers in this study worried about not having enough money to finish travelling and wondered how much they would spend. Being able to get predictions of future expenditures, find cheap routes and track expenditures would help backpackers. Other research has investigated work patterns and financial concerns of backpackers (Richards & Wilson, 2004).

3. **Determination and comparison of cost.** A recurring theme was backpackers asking how much things cost. This usually evolved into a cost comparison discussion in some way. This is information which is often hard to get when far away from a location, and the subject of a great deal of backpacker gossip.

4. **Object-centric information.** Backpackers often asked about objects in their environment. This ranged from species of kangaroos to historical significance of buildings. Some of these objects move between locations, so it is not necessarily geo-tagging. Social and practical significance of objects is at least as important as object identification. This represents a very large number of possible objects and is probably best supported by distributed volunteer authors to be feasible.

5. **Record and share the travel experience.** Backpackers in this study were constantly taking pictures and then showing them to others in their subgroups. They also greatly enjoyed a having a picture taken of themselves holding a koala. Travel is adventure, and adventure produces good stories for others. Recording travel experiences helps the user to remember what they did and gain social status with others at home (Yarnal, 2004). It also can work as a group awareness tool for concerned members of the backpacker's social network. Current methods of doing this are expensive, difficult and technical. There is significant room for improvement and great demand for these types of products.

6. **Manage opinions from different perspectives.** Backpackers don't always want official information and they don't always want informal information from other backpackers. Different situations demand different information and methods need to be in place to allow evaluation of different perspectives. Backpackers already do this when evaluating advice from other travellers. Similar data to support evaluation needs to be provided in any digital service.

7. **Support multi-language usage.** In both studies we had travellers with English as a second language. Extensive use of foreign languages was seen in both studies and translation of English or words from other languages was observed to be a problem.

8. **Mobile interaction.** Backpackers commonly waited to write on their prototypes until they were able to sit and lay down other items they were carrying. However, the potential uses for the devices commonly occurred while walking as well as while seated. It is likely that it was the need to use a pen to draw on the prototype that encouraged backpackers to use it while seated. Interacting with a device while walking in social settings and carrying other items will remain a necessity for many mobile device services, and interaction methods should support it (for similar conclusions see: Axup et al., 2005; Lumsden & Gammell, 2004).

9. **Default to local services but support remote access.** Many of the activities backpackers want to do are associated with the people they know nearest to them, and the environment they are directly interacting with. However, backpackers are continuously connected to social networks of other backpackers they have met and friends and family at home. Communications with other portions of the distant social network may occur at any time, as may the need to access information the immediate group or environment does not have.

10. **Open access to other information sources.** The technology should not seek to be the global provider of information. The more information that is available from diverse external sources, the more valuable the device that provides it becomes. Open standards with other geo-tagging networks and recommendations for

competing information resources should be encouraged. The device that provides the best access to all the information sources backpackers need, at a low price, is likely to be most attractive to them.

11. **Encourage and facilitate social meetings.** Not all backpackers who would enjoy or benefit from meeting, end up meeting each other. MIS-2 clearly shows cases of backpackers who didn't find common ground or accessible methods of getting to know one another, even when in close proximity to each other. Any excuses or added information for backpackers about others in the group would be likely to facilitate this.

5.8   Proposed Product Features

Feature	Description	Applications / Requirements / Comments	Source Data / Justifications
1. Check Out This Good Spot	An easy way to tell other backpackers about a spot you really enjoy.	• Method of describing locations • Way to add comments and have reputation determined • Way for people to find it when it is relevant	• want to stop at yogurt store, they really like the yogurt • device to label location • they finished the koala photos "ok, we can go home now."
2. Assistance Bell	Rapidly contact staff at the current location for assistance.	• Standard method of determining contact device being used at location • Needs to be as quick as hitting a bell would be	• no cups for coffee, no help downstairs
3. Cost Of A Travel Route	See how much others have recently spent between point A and B.	• Access to how much others have spent between specific points • Method of posting queries to others who have travelled the desired distance	• Money issues • Spend $ here or at home • Balancing debt • find cheapest route
4. How much does _____ cost?	Check comparative prices for a given activity, object or service.	• Possibly access to retail databases about stock and pricing • Support backpackers logging products they purchase	• ask about cost of skydive • wondering about prices of boomerang, here or in other cities. • talking about how much they spent for two nights in byron ($60)

5. What is this?	Identification of objects and related social and functional uses.	• Possibly image identification • Possibly image/text queries to backpackers or staff • Possibly tags in the environment that are read • Google linkup • Animal collars with speech output or wireless data	• wondering about small roos • ask about purpose of casino building • wondering if both sexes have pouches • asking about what a "monitor" was • question about Powdermelons
6. Where am I?	Find the location of the user, their group members and nearby resources.	• Indoor and outdoor usage • Locations of people • Rapid visual representation based on current location	• trying to figure out where they are • they are unsure where they are. • "were slightly unsure of where to go"
7. Where is _____?	Find location of other places relative to self.	• Google maps • Maps relative to current location • Distance and time measurements to target	• asking about the location of Mooloolaba • "How far is the boat from here? Maybe 5 minutes?"
8. This is what I am doing.	Share your current travel experiences with others.	• Mobblogs • Cameraphone compatibility • Easy annotation and tagging • Wireless uploading	• explained how to send packages • using outline to track travel • asking Jeff to take photos with their camera • looking at photos on camera, discussing how good looking guys on their cameras are
9. I want to give this to someone.	Share physical gifts with others far away or get people to store things for you. Methods of simplified overseas mail.	• Related to avoiding theft by sending home. • Send mail in hostels (mail kiosk?) • Access to post information • Digitizing of physical items to make transfer easier	• explained how to send packages • storing photos in larger bag (problem how to store, keep larger items) • wondering about shipping stuff again. Costs and weight • they are talking about maybe sending a tracked package to avoid loss

10. What is in this cage?	See animals in more ideal positions or states, identified and located within the cages.	• Video terminals near cages • Wirelessly broadcast stations to mobiles in vicinity of cages • Transfer of "perfect pics" to phone of interested guests • Infrared mode on phone for seeing animals on screen	• taz devil, can't see because of glass glare • not able to see animals at all times • "where are you?" • trouble seeing lizard due to camouflage • say they want the baby to come out to look at it
11. How can I find _____?	Connect user with location or other information about desired topics.	• Google connection • Local wireless listing of resources • Group annotated list of resources for gps coordinates or object • City listings of public resources with coordinates • Product listings	• location of Floria jeans • price of property on river • cheap outlets for shopping • starving and wants coffee • say they want it to find food • "do you know where there's a tourist information office?" • talking about need for rain gear
12. What does this say?	Translate small amounts of written or spoken text in the environment to English, or the user's first language.	• Also needs to identify languages • Word by word may be acceptable (e.g. babelfish)	• "what language is this?" • says she wants to talk to people who speak Chinese
13. What is the quality of _____ ?	Determine what others have said about how good or bad something is.	• Annotations of objects, services, locations • Searchable, often with current location as default	• wondering about food on boat • cheapest + quickest (function) (for food) (quality) not absolute cheapest • talking about the quality of the sandwich
14. Find other people similar to me.	Some questions are best answered by those in a similar situation and sometimes it's comforting to be with similar people.	• Support both collocated and distributed cases • Need for personal attributes of backpackers • Maybe a friend-of-a-friend system would be better than just keyword matches	• wondering about eating vegetarian in Asia • asking about visa requirements for Americans in Asia • she asks for vegetarian option and has to choose twice as other has meat

15. Find a friendly local	Locals have information travellers do not.	• Reputation system • Public meeting spots • Excuses to meet	• asking about whether Jeff has Australian residency • asking Dan about what degree he's doing • they are asking about how kangaroos exist in ""the real world"
16. How can I get to _____?	Different routes and transport options to a given location.	• Sometimes far away and sometimes in immediate environment • Listings of transportation costs • Links to transport sites • Other backpackers accounts of travel options and costs	• talking about whether boat is only way to get to lone pine • they want to see taz devil, "guessing it is that way" • want to find cheapest way to get to Nimbin • wondering about public transit in Sydney
17. Money management	Access bank account to make and track purchases.	• Project travel costs • Money spent • Emergency funds access • Funds available • Allocation of funds to different purposes (e.g. airline tickets) • Tracking expenditures	• "I need to find out my bank balance" • "and I need to find out how much everything is going to cost, that I have to pay for" • "and then work out how much spendable money I have." • thinks she has $500 for 2.5 weeks, other girl has $400 left • "god knows how much we spent in fiji"
18. Currency conversion	Easy transition between current and home currencies.	• Net updates for currency rates • Fast to use with defaults set properly	• they are converting currencies back into pounds • talking about exchange rates to home currency
19. How did others handle this?	Official information doesn't always say what you need to know. Other travellers may have found solutions to the problem.	• Backpackers tips on certain locations or activities • Provide status rewards for sharing tips • Perhaps need to be private from locals	• they are asking if they can put more than one person in the photo • asking Dan about how long it takes to go around the park
20. How should I act here?	Social norms or purposes of locations are not always clear.	• Official and non-official accounts of how people should behave • Tips, manners, slang, uses of spaces	• looking at pamphlet to see if can touch roos, [BP7] is still unclear whether she can touch them

21. Store my data.	A method of storing large amounts of travel data in a highly cheap and usable fashion.	• A wireless hard drive or memory card? • Personal media players • Integrate storage with display and sharing? • Wireless upload to remote location for safe keeping	• "they are taking videos, but afraid it will run out of space" • talking about how much memory they need • multiple memory card issue • afraid of CDs
22. Share the fun.	A way to tell people about amusing things in certain locations.	• Geo tagging, or object tagging • Fun keyword searches • Way to be contacted about jokes	• laughing about crock warning sign • joking about frog that cures herpes • joking about Skippy the roo
23. What did others think of this?	See what others thought about an object.	• Possibly a mix of official and non-official comments.	• discussing whether plant in tank is fake • they are complaining about the pigeons • thinking the roo is hurt

6   Conclusion

The MIS-2 study observed behaviour and usage of a variety of mobile device prototypes by seven backpackers on a tourist field trip. The study was the second iteration of the MIS-1 study which observed more natural interaction without device prototypes. MIS-2 also investigated a social pairing system to connect backpackers with others who have the travel information they need. The study also investigated revised research methods for mobile groups, based on recommendations and experiences running MIS-1.

Study results include a rich understanding of conversation topics, in-situ effects of mobile device usage, and research method verification. Subgroups of participants within the study didn't communicate much between each other and provided an interesting case of backpackers failing to connect even though they desired to. A field trip representing a typical tourist activity produced a number of situations where mobile device features were requested by participants. The social pairing activity produced some useful information for participants and provided design recommendations for social pairing systems. 11 design requirements for mobile travel devices were generated from observations and discussions with backpackers. Additional analysis produced 23 proposed product features. Recommendations have been made for improvements to the study design and methods for future mobile group research.

A number of areas for future work have been identified. These include: continuing variations in the research methods used, expansion of the participatory social pairing activity to more participants, use of semi-functional prototypes and plans for the design of a dynamic reporting system for mobile, group ethnographic results.

7   Acknowledgements

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9 Appendix A: Pre-study Questionnaire

'Mobile Information Sharing' Research Study

Pre-study Questionnaire (Q2)

Name: _____

E-mail: _____

All of the demographic information below will be used anonymously.

1. **How old** are you?
   - ☑ under 21
   - ☐ 21-25
   - ☐ 26-30
   - ☐ 31-35
   - ☐ over 35

2. What **country** are you from?
   ENGLAND

3. **How long** have you been traveling for, on this trip?
   5½ MONTHS

4. Are you **traveling alone** or in a group?
   - ☑ Alone – until now (yesterday)
   - ☑ In a group, there are __3__ people in it.

5. **How do you feel** about the other people recruited for this study today?
   (This will not be shown to other participants.)

Enter the names of the other participants across the top row below.

Person's name						
Enter a number in each box below. Scale is **0** (never or very low) to **4** (often or very high)						
How **frequently** do you communicate with them?	1	1	0	0	4	4
How **strong is the bond** between you?	0	0	0	0	4	4
How much do you **trust travel information** from this person?	2	2	2	2	3	3
Enter a **number and label** for time (e.g. 1 week) or **yes or no**						
Are you **traveling** with this person? If so, enter **how long** in days or months.	No	No	No	No	10 days	10 days
How long have you **known** this person for? (Enter none, months or years.)	none	none	none	none	8 years	8 years

<please see second page>

Pre-study questionnaire with demographic questions and a chart showing participant names and various tie strengths relating to each person.

10 Appendix B: Post-study Questionnaire (page 1)

BP6

THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

'Mobile Information Sharing' Research Study

Post-study Questionnaire (Q3)

All answers will be anonymized in any published research. BP 6

Name: _____

(The remainder of this questionnaire will not be shown to other participants.)

1. **How do you feel** about the other people recruited for this study today?

(Write in each persons name in the boxes below)

a) Person's name						
Enter a number in each box below. Scale is **0 (never or very low)** to **4 (often or very high)**						
b) How **frequently** did you communicate with them today?	2	2	1	1	4	4
c) How **strong is the bond** between you?	0	0	0	0	4	4
d) How much do you **trust travel information** from this person?	2	2	2	2	4	4

<Turn to the next page>

The first page of the post-study questionnaire asking about social tie rankings.

11   Appendix C: Post-study Questionnaire (page 2)

The following are things you expressed an interest in, on the questionnaire earlier today.

2. In the tables below, please indicate whether you discussed this topic to your satisfaction with another member of the group during the activities today. If you did, please indicate the names of the people you discussed it with.

Future Locations

Location	Activities you want to do there (if any)
a) BRISBANE, KOALA SANCTUARY	HUG KOALA
Did you discuss with other group members today? ☐ No ☑ Yes, with whom?	
b) BYRON BAY	FESTIVAL
Did you discuss with other group members today? ☐ No ☐ Yes, with whom?	
c) SYDNEY	BRIDGE CLIMB
Did you discuss with other group members today? ☐ No ☑ Yes, with whom?	
d) NIMBIN	SHOPPING
Did you discuss with other group members today? ☐ No ☑ Yes, with whom?	
e) BANGKOK	TEMPLE
Did you discuss with other group members today? ☑ No ☐ Yes, with whom?	

Travel Questions

Location	Activities you want to do there (if any)
a) S.E. ASIA	EASE OF TRAVEL
Did you discuss with other group members today? ☑ No ☐ Yes, with whom?	
b) BYRON BAY FESTIVAL	GET TICKETS
Did you discuss with other group members today? ☐ No ☐ Yes, with whom?	
c) NIMBIN TO BYRON	DISTANCE!
Did you discuss with other group members today? ☐ No ☐ Yes, with whom?	
d) SYDNEY	BRIDGE CLIMB COST?
Did you discuss with other group members today? ☑ No ☐ Yes, with whom?	
e)	
Did you discuss with other group members today? ☐ No ☐ Yes, with whom?	

<Turn to the next page>

The second page of the post-study questionnaire which asks participants whether they discussed travel topics during the field trip.

12 Appendix D: Returned Postcard

A postcard returned by a backpacker a week after the study was completed.