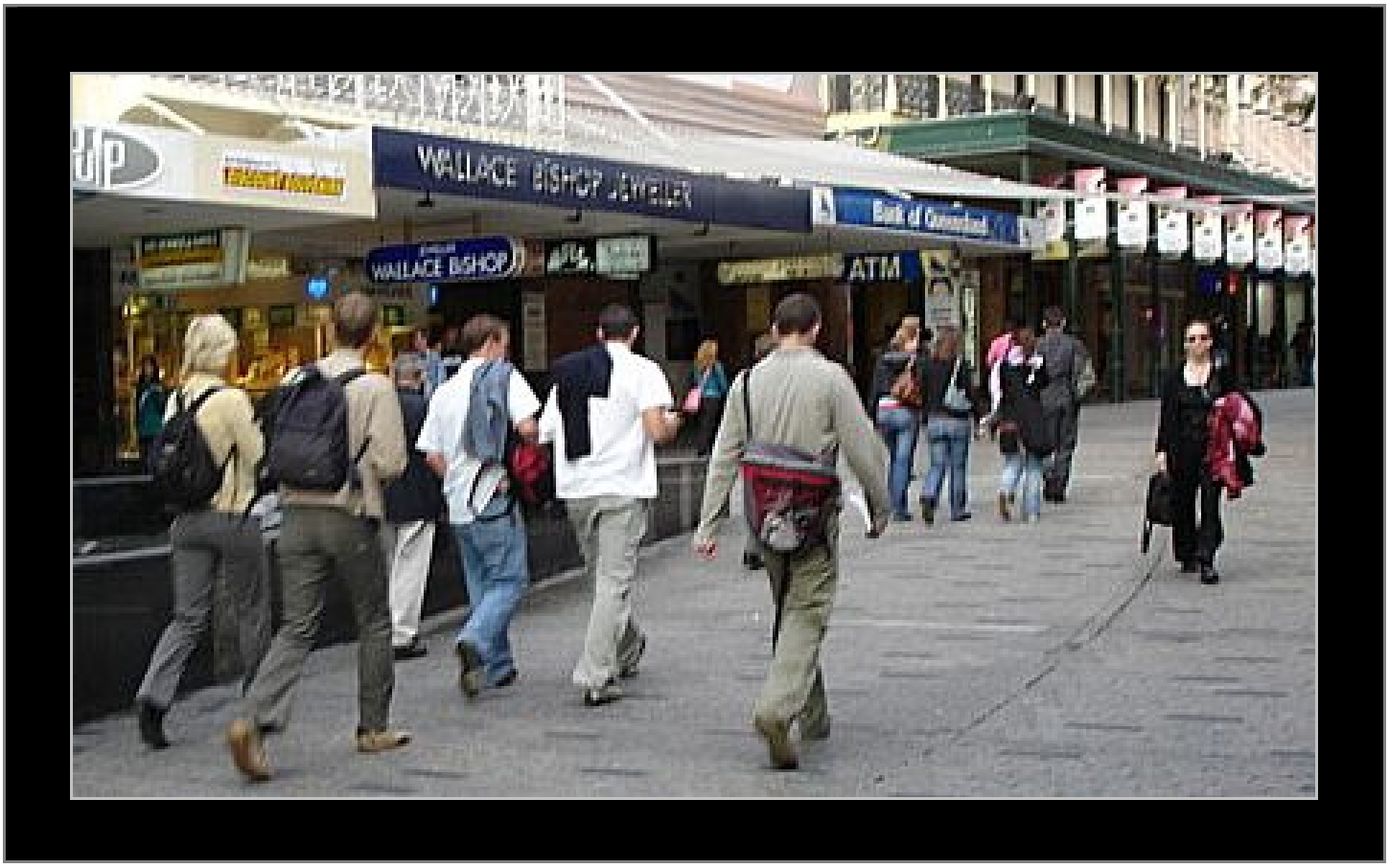

Methods of Understanding and Designing For Mobile Communities

Jeff Axup, B.S.

Information Technology and Electrical Engineering (ITEE)

Ph.D. Thesis

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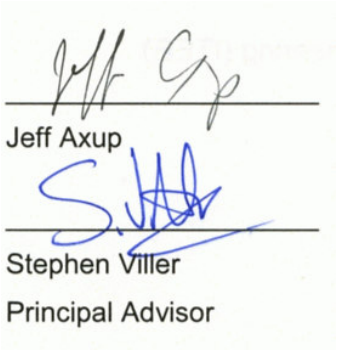
Statement of Originality

The work presented in the thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text. The material has not been submitted, either in whole or in part, for a degree at this or any other university.

Few written works are entirely the product of one individual and this is certainly true for this thesis. I have had numerous colleagues and friends review my work, offer suggestions, recommend various books and papers, and co-author papers with me. My appreciation for these individuals' contributions is expressed in more detail in the Acknowledgements section.

Much of the thesis, in particular the Discussion, Method and Discussion chapters, have benefited from the work of several of my co-authors. These include my advisor Dr. Stephen Viller, Associate Advisor Ian MacColl, and colleagues Dr. Nicola Bidwell and Roslyn Cooper. There are times in the thesis where I use the first person 'I' to refer to my work. Where possible I have indicated when work was jointly created, but in some cases the first person will obscure the assistance I have received. I was the primary author on all of the papers which I draw directly from, but my colleagues' writing has contributed to this thesis. In most cases, the content was created by myself with additional ideas and revisions supplied by my co-authors. Some of the papers were published in refereed journals or conferences, and some are currently under review, or were published as un-refereed technical reports. The majority of the thesis derives from these papers, but there is a significant amount of new content as well. The papers which this thesis draws upon are listed in the List of Publications section below.



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List of Publications

Publications Forming Part of the Thesis

Refereed

1. Axup, J., Viller, S., MacColl, I & Cooper, R. (2006). **Lo-Fi Matchmaking: A Study of Social Pairing for Backpackers**. UbiComp 2006, Orange County, California, USA.

2. Axup, J., & Viller, S. (2005). **Formative Research Methods for the Extremely Mobile: Supporting Community Interaction Amongst Backpackers**. Presented at workshop: "Appropriate Methods for Design in Complex and Sensitive Settings" at OzCHI 2005.

3. Axup, J., & Viller, S. (2005). **Augmenting Travel Gossip: Design for Mobile Communities**. In the Proceedings of OzCHI 2005, Canberra, Australia.

4. Axup, J., Viller, S., & Bidwell, N. (2005). **Usability of a Mobile, Group Communication Prototype While Rendezvousing**. Proceedings of 2005 International Symposium on Collaborative Technologies and Systems - Special Session on Mobile Collaborative Work, St. Louis.

Non-Refereed

5. Axup, J., & Viller, S. (2006). **Lo-Fi Matchmaking: A Study of Social Pairing for Backpackers**, (No. 463). ITEE, University of Queensland. http://eprint.uq.edu.au/archive/00003985/

6. Axup, J., & Viller, S. (2006). **Sampling Mobile Opinion: A Contextual Postcard Questionnaire Study**, (No. 461). ITEE, University of Queensland. http://eprint.uq.edu.au/archive/00003982/

7. Axup, J., & Viller, S. (2006). **Exploratory Research Methods for the Extremely Mobile: Supporting Community Interaction Amongst Backpackers**, (No. 462). ITEE, University of Queensland. http://eprint.uq.edu.au/archive/00003984/

8. Axup, J., & Viller, S. (2006). **Co-creating New Mobile Devices for Groups During Field Trips: MIS-2 Study**, ITEE Technical Reports (No. 460). http://eprint.uq.edu.au/archive/00003610/

9. Axup, J., & Viller, S. (2005). **Conceptualizing New Mobile Devices by Observing Gossip and Social Network Formation Amongst the Extremely Mobile - Mobile Information Sharing 1 (MIS-1) Study**, ITEE Technical Report (No. 459). University of Queensland: Brisbane, Australia. http://eprint.uq.edu.au/archive/00003287/

Other Relevant Publications Not Included in the Thesis

10. Foth, M., & Axup, J. (2006). **Participatory Design and Action Research: Identical Twins or Synergetic Pair?** Participatory Design Conference (PDC 2006), Trento, Italy.

11. Axup, J. (2006). **Blog the world**, Vodafone Receiver (Vol. 15 - Wish you were here). http://www.receiver.vodafone.com/15/articles/index05.html

12. Viller, S., Brereton, M., Redhead, F., & Axup, J. (2005). **A Collaborative Digestion and Design Game for Community and Technology Exploration**. Proceedings of the 2005 Conference on Designing for User eXperience - DUX2005, San Francisco, CA.

13. Bidwell, N. J., & Axup, J. (2005). **The Territory is the Map: Exploring the Use of Landmarks In Situ to Inform Mobile Guide Design**. Xth Int. Conf. on Human-Computer Interaction (INTERACT05).

14. Axup, J., Bidwell, N. J., & Viller, S. (2004). **Representation of Self-Reported Information Usage During Mobile Field Studies: Pilots & Orienteers 2**. OzCHI 2004: Supporting Community Interaction: Possibilities and Challenges, Wollongong Australia., 1-10.

Abstract

Society is increasingly on the move, mobile devices are commonly being used to coordinate group actions, and group communication features are rapidly being added to existing technologies. Despite this, little is known about how mobile groups act, or how communications technologies should be designed to augment existing behaviour. This is partially due to minimal research being done on the topic, but also to the lack of research methods available to study the topic with. Mobile groups are challenging to study because of frequent and long-duration movement, frequent distribution, and the rapidly changing environments they operate within. To address these issues, this research focuses on methodological issues surrounding the development of mobile devices for mobile groups and communities. More specifically it addresses backpackers, who are a relevant example of this type of community. The research primarily explores the convergence of computer supported cooperative work (CSCW) and the field of mobile device development. This enables the combination of emphasis on designing technologies for groups, social implications, mobile device design, and mobile settings.

Major research outcomes presented in this thesis lie in three areas: 1) methods, 2) technology designs, and 3) backpacker culture. Five studies of backpacker behaviour and requirements form the core of the research. The methods used are in-situ and exploratory, and apply both novel and existing techniques to the domain of backpackers and mobile groups.

Methods demonstrated in this research include: *field trips* for exploring mobile group behaviour and device usage, a *social pairing exercise* to explore social networks, *contextual postcards* to gain distributed feedback, and *blog analysis* which provides post-hoc diary data. Theoretical contributions include: observations on method triangulation, a taxonomy of mobility research, method templates to assist method usage, and identification of key categories leading to mobile group requirements. Design related outcomes include: 57 mobile tourism product ideas, a format for conveying product concepts, and a design for a wearable device to assist mobile researchers.

Our understanding of backpacker culture has also improved as a consequence of the research. It has also generated user requirements to aid mobile development, methods of visualising mobile groups and communities, and a listing of relevant design tensions. Additionally, the research has added to our understanding of how new technologies such as blogs, SMS and iPods are being used by backpackers and how mobile groups naturally communicate.

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III. Preface

I backpacked for a year around Australia and Southeast Asia in 2002-3. While travelling I noted how regularly I had to orient myself in new locations and how often I got lost. I frequently wondered where to find necessities, and I tried to figure out the local culture. Guidebook entries helped, but chatting with other travellers that I met in hostels, restaurants, busses and boats offered the most insight and entertainment. I also noted the limits of existing technologies supporting the travel lifestyle. Internet cafés seemed ubiquitous, even in small villages in Vietnam and remote islands in Thailand. However, the Internet largely connected travellers with those at home, and occasionally with backpackers they had met long ago that were still broadcasting travel diary updates. It appeared that there was an opportunity to investigate what technological artefacts backpackers would find useful while exploring foreign lands. So I started applying for Ph.D. programs. I had my original transcripts and birth certificate mailed to me poste restante (a system of collecting mail from local post offices) in Thailand. I updated my resume and filled out university application forms from Internet cafés. I was living a mobile lifestyle. However, with the exception of occasional calls from my parents on my mobile phone, the only place I could do my everyday business was in a stable café. Similarly, any travel research I needed to do was either done through a paper guidebook, chatting with those around me, or back in the office-like environment of the Internet café. Clearly there was more that could be done with mobile devices to assist both my travel and my career goals – only no one had created them yet.

Several years later, I was working on a Ph.D. on the topic of researching mobile communities and developing mobile devices for them. As part of this I was conducting some research with TravelPod, a company supplying travel blog (web-based diary) facilities to backpackers. There I met Carmella, one of their recent employees who impressively had been travelling for three years straight. She has an account under the pseudonym WhereSheGoes, and had been blogging about her travels every few days during the entire trip. She had circled the world several times and touched all of the world's continents. And now she was finally returning home – via a cruise line between Europe and the USA, which most people choose to fly. Clearly she is someone who intimately understands what it is to be a backpacker and who might be able to convey part of the experience to others.

Backpackers have become the primary focus of my research for a number of reasons. First, they are friendly and interesting to talk to. Second, they are easy to bribe, which is important when trying to find participants to take part in boring research studies. Third, they represent an enormous mobile community with very little technological support, which still manages an effective social network providing travel tips. But as is the case with most rich social experiences, a few words summarising major aspects of a culture do not do justice to the original experience of living it.

Since my thesis is surely not going to do justice to what *it really is* to be a backpacker, I have determined that someone who can truly be termed a professional backpacker should tell part of the story herself. Accordingly, I have interviewed Carmella (WhereSheGoes) about her travels, and have selected excerpts from her blog to illustrate points that are representative of the broader backpacking experience. If you are interested in hearing an entertaining travel story which helps to contextualise the research, please read on. Alternatively, if you want to immediately sink your teeth into the research, please go to the Introduction in Chapter 1. My sincere thanks go to Carmella for her willingness to share her travel experiences with the readers of this thesis. Her trip started in Europe and took her to many exotic locations. The following sections relate Carmella's experiences and opinions about various aspects of travel. In some ways it is the 'story behind the blog' and in many ways it is the story of 'the dedicated backpacker'.

Life Before Travel

Before someone has truly been 'bitten by the travel bug' and can identify strongly with being a backpacker, they always have a first trip by themselves or with friends. They frequently do not have much experience at this point and are typically in their late teens or early twenties. Leaving one's own country for the first time, and for a long period of time (often for a year or longer), is frequently a scary experience. Reasons for travel vary, but it always takes some commitment to extract oneself from the routines and responsibilities of daily life. Carmella faced these issues and other practical matters such as: finding funding for such a long trip, the dilemma of whether to study now or later, and how to balance work and leisure.

"It was not my intention to travel around the world. It was never really my goal. When my parents divorced, we did not have much money so if I wanted something, I had to work for it. My mom could not give me an allowance anymore so I found other little

jobs. I moved out very young and realized that although I had been accepted, I could not afford to go to University. So instead of borrowing (I hate being in debt), I decided to work and save the money. I did not know what I wanted to study yet anyway and did not want to waste money on a degree I would not use. By the time I had enough money, I still did not really know what I wanted to study. I guess I thought that travelling would be a better use of my money and that I would learn a lot more than in a classroom. Plus I had worked so hard for so many years, I desperately needed a vacation. Or more like a sabbatical.

I worked for a lot of years making lots of money but burnt out at 25. Realized that life was not about working and happiness was not determined by the number of inches of your TV. So I quit the job and sold everything I owned (more or less...kept a few investments) and left. I had a good relationship with my family and friends but I felt like I was not really growing. I could go to University but I did not know what I wanted to study. I never really thought backpacking was very interesting but then all of a sudden, it just seemed like the right (the only) thing to do. I kind of came to a point in my life where something needed to change. I was not sure what that something was so I just changed everything…"

Leaving Home

The beginning of Carmella's blog relates the excitement of leaving home.

"I am finally ready to go. I have quit the job, sold the stuff, and said goodbyes. I am leaving in less than a week. My sister will be driving me down to Calgary to catch my flight. I am still not really nervous but I get emotional some days thinking about what will come of all this. Everything in the planning for this trip has come so easily which just reminds me that I am on the right path. I hope to get any last minute errands done this week. I am still in search of the perfect shoe."

In many ways the challenge of being a successful backpacker is knowing what to leave behind. Backpackers primarily have the possessions that they carry on their backs available to them. While backpacks can get fairly large there is a limit to what can be comfortably carried. Thus, there is a tendency to analyse what is really needed, and to highly appreciate good travel gear. New travellers often do not know what to pack and even seasoned travellers can find that different equipment is needed in various locations.

"The gear I bought was mainly trekking and outdoor gear. First I found the smallest backpack I could that would have a detachable daypack. I did not want to be one of these people carrying around their house with them. As for clothes, I had a few pairs of zip-off pants (legs come off converting them to shorts) and a variety of tops. Almost all my clothes were wrinkle free and thin quick dry material. I had one white shirt that I lost in the first few days. White is not a good travel colour. Great was a travel towel from Hostel International. Its soft and thin and dries quickly. Love it. Soaks up a lot. Then I had a really great sleeping bag that packed into a tiny ball. It was wonderful and saved me many times...I tend to get cold. I bought my ticket from a student/adventure travel place (a branch of TravelCuts). I spent very little time and just kinda went with it. There was a sale through an Asia airline so I got that one but it ended in New Zealand. I planned to buy more tickets later on. So I did not start with [an] around the world ticket, but I ended with one."

Everyone develops some understanding of foreign countries via television, books, newspapers and other media. Sometimes this is the reason people choose to go to a location. However sometimes as in Camella's case, it is simply the desire for something new that prompts a trip.

"Regarding expectations of Europe. I did not really have any. Here is the thing. I spent a lot of my life until this point working and in a serious mindset. I had not really thought much about anywhere else. I was focused on work. I did not really know what to think about other places. I guess I knew they would speak other languages and that it would be old. That is about the extent of it. Simple, I know. I just wanted to adventure. The only thing that I was sure would change was the fact that I was no longer stuck in a schedule and planning my days out to the minute as I had in my old job. Now I was free."

Change In Perspective

Arriving in a foreign country for the first time can be a surprising experience. Language, money, customs, driving rules, people, clothing and many other things can be dramatically different than what one is accustomed to. Being away from home for long periods can produce a disconnection from familiar norms and allow backpackers to try new lifestyles. It is also well documented that people often experience culture shock when travelling. Carmella experienced these things and discusses how travellers change while away from home.

"Before my round-the-world trip, I had done the typical week to two week long packaged holidays. I would not say that is travelling though. I had been on cruises, resorts and short holidays but never had left the continent (or my comfort zone). I suppose that in the beginning when I arrived in Europe, I was overwhelmed by the change in culture, language, architecture, landscape...everything."

Her blog during this period relates the wonder and understandable confusion with which she experiences the locations she travels through.

"I am finally here. I am really tired and this keyboard is funny...the 'y' is not in the right place and there are dots on top of the letter öäü. It is a different world here. Note to self: buy compass. I got lost 4 times today. Its ok though because I got to see places I prolly would not have gone to by plan."

"Yesterday I went on a motorcycle ride all over the place. The scenery is so picturesque. I saw sheep, rolling hills, snowy capped rock towers ;)... It was just like the postcard! I really hope that all is well where you are. I go to bed so happy that I have such wonderful people in my life. It is really starting to hit me that this whole trip...is pretty special. I know its only the third day but I have to wonder when the surreal feeling will wear off. But then I stop, because I realize that it will only wear off if I let it."

When I talked with her she reflected on how the experience of travelling by herself for so long has affected her.

"Comparing the beginning to the end of my travels, I would say that I have grown in many ways. I am more open-minded to new things and much more willing to try just about anything. Instead of being threatened by things that may be different than what I am used to, I now try to understand them rather than judging and labelling them. I see diversity as a learning experience and chance to grow. "

"[For example, while] speaking with someone with different views or morals or values, I no longer feel the need to convince them of my thinking. I would rather listen and learn why and how they get to their conclusions. Perhaps I am more flexible. I have realized that there are many many ways to get to the same place. And my way and your way may both be correct. So I try to listen more. I try to understand why. I

am more careful and responsible with my words and actions than I was pre-travel. I see how much of an effect they can and do have. I am trying to live in a heightened awareness causing the least amount of unnatural disruption. If I can benefit the environment around me, then that is a bonus."

The Travel Experience

Many unexpected things happen during travel. These events can range from being awe inspiring, fun, tedious or frightening. Occasionally situations arise which are 'perfect moments', as the following blog entry indicates.

"The sailing conditions were perfect as the sun shone down over the ocean as we ploughed through the slight waves. Every now and then a fine mist would fly over the deck cooling us just enough. We were all in great spirits as we anchored just off Great Keppel Island. There were only a few other boats in the area and the long white beach was deserted."

Even common activities such as staying at hostels can produce fun experiences. When Carmella was in Switzerland she enjoyed the atmosphere and accent of the locals where she was staying.

"I am staying at the Funny Farm. You can just sit and play monopoly, or chat with one of your newfound friends. Because here everyone is your friend. I have already gotten pages of travel advice. Zou can play tennis, foosball, pool, or ping-pong. Or zou can jump out of a plane if that is what floats zour boat. I mean, zou have to sleep in a barn but reallz who would not want to sleep next to Mr. Ed or Babe? How often do zou get to sleep below Mickey Mouse or Felix the Cat? Everyone I have met (prolly 30 new great people in just one day) is such a character and has so much to say. I love it."

However, not all experiences are pleasant. An example of a frequent experience which can be tedious is transportation. One of Carmella's blog entries discussed a particularly trying flight to the Seychelles islands.

"The plane ride was a bit tedious, but luckily I was able to block out the problem with a movie I blasted in my ears which took up almost the whole plane ride. The whole plane (and it was a 747…but not all 400 seats were full) seemed to be all honeymooners and couples…except for this one family of five which consisted of two oblivious parents with three bratty boys who terrorized anyone within 10 feet."

Unfortunately not all travel experiences are enjoyable or safe. These experiences often make good stories later, but they are stressful when they happen. Surviving one tends to increase the self-confidence of the traveller greatly and enhance one's ability to cope with future situations. Carmella relates a particularly trying experience in Greece.

"I asked about 15 travel agencies how I should get to Patras (which is 3 hours away by bus and 4.5 by train). No one knew. Or shall I say no one wanted to tell me. I was getting very frustrated because I knew that they knew but because I was not buying anything from them, they refused to help me. "

"I could not find a bus for the life of me so I decided to take the train. I knew where the metro was so surely I could find the way. About three stops into it and a half hour later, I realized that there was no way I would make my midnight ferry if I took the train route. So I got off and went back the other way to where I had started. I began asking another 10 travel agents, by now having tears in my eyes dreading spending the night in Athens and missing my ferry to Venice. "

"Finally a girl told me to take a taxi to this place that starts with a K and there would be a bus there. I had to repeat the name of the bus station 5 times so I would get it right to the driver as many of them do not speak English."

"Next, hoping I was on the right track and only 5 hours away from midnight, I tried to hail a cab. Would you believe NO ONE would stop for me! I could not believe it! Here I was practically THROWING myself in front of them and they just sneered! Then the seediest looking prolly not even a real licensed cab stopped. It had a makeshift taxi sign on top and was very beaten up. I had no choice. I got in and repeated the "K"

place. Then I asked how long it would take but the driver informed me he did not speak any English. I sat there watching him chew off all his finger nails into bloody stumps as he drove me into the most deserted and decrepit parts of Athens. I was sure I was about to be raped and murdered, so almost in tears I prayed again for the hundredth time that day. I reminded myself I could not cry because that would prove that I did not have faith...and then what would I have."

"I can not tell you the tidal wave of relief that washed over me as we suddenly turned a corner and there was the bus station. I hurried to the Patras bus stop and it was just pulling out. I begged the driver to take me but he said that I did not have a ticket. I had to go 50 feet to buy a ticket. By the time I got my ticket a few minutes later, he was gone. I would have to catch the next bus which was cutting things dangerously close."

"I got to Patras at 11pm and still had to validate my ticket at the Minoan Lines ticket office which was 9 or 10 long blocks from the ship. I decided to cab it and hope that the office would be open, which it was, and then finally I made it onto the ship. For the 4th time that day, I almost cried but now it was from relief and happiness. I found my little spot on the floor of the ferry opened up my sleeping bag and proceeded to sleep for the next 26 hours."

It is these types of situations which most backpackers would prefer to travel without, and are the impetus for much of the research in this thesis.

Planning During Travel

Part of the joy of backpacking is the freedom it provides. Many backpackers avoid planning, instead choosing to take advantage of chance opportunities and see where the journey takes them. However, there are circumstances where planning is necessary and useful. I asked Carmella what she thought of this.

"I do not really plan too much though it really depends. I could tell you a bunch of different factors it could depend on like time, accessibility to planning resources, money, but most of all, it comes down to mood. If I feel like it, then I plan. If I do not feel like it, I do not. Sometimes you can get better deals if you plan ahead but then sometimes you can get better deals by waiting until the last minute. There are some countries that they say are very dangerous or busy so you should make sure you

have something set up. But I am not afraid of not having plans. I see it as an adventure."

"There is as much freedom as you allow yourself. Only you restrict yourself. It seems to all come down to choices. If there is something you MUST do then I suppose planning ahead would be helpful. If you are restricted by money or time, you may need to be more purposeful in your travels. If you have certain goals you must achieve, like seeing a certain country, then you must find out if you need a visa or certain vaccinations. But for me, I lean towards not making too many commitments. I am not too upset if I do not get to see some monument or church or landmark. If it is closed that day or I should have bought tickets in advance, then I skip it. Planning and scheduling life reminds me too much of my old job and now I try to relax and take it as it comes."

"Some people think planning allows you freedom but too much can be restrictive. I suppose backpackers are typically more laid back, open-minded, flexible and adventurous than the other types of travellers. This is a very general statement and one really must take each person on an individual basis. Every traveller seems to have their own style. I have seen backpackers who schedule everything down to their rest stops even using a day timer! Then I have seen people in resort packages wandering about in local hangouts looking for new experiences, no map and no preconceived ideas."

Stages In Life and Returning Home

Travelling can be difficult, and the frequent and dramatic changes in environment have an effect on the backpacker. Living this type of mobile lifestyle often provides new perspectives on what home is and how stability plays a role in life.

"To me, travel means experiencing life on different levels. At home, or in stable consistent environments, one may be limited in what they are exposed to. When travelling, there is a much higher number and intensity of unique learning experiences and challenges. So in a way, travelling is a way to accelerate one's growth."

"After three years of travel, I definitely think a break is in order. If there is one thing I have learned, it is the importance of balance. So I feel it is time to rest, recuperate and process all the events of the past few years. In a way, I see it almost as a decompression period. Like I have collected puzzle pieces from all over and now it is time to sit down and try to put them all together."

"Like I said before, there is definitely a need for balance in life. Too much of anything is not usually a good idea. I think that to know one side, you must know the other. Having both perspectives can give you a much better understanding, and that is to me what life is all about. Understanding. I see the benefit in both ways of life and I think that like most things, it can be a cycle."

Sometimes it is not the type of transit or choice of locations that sets backpackers apart, but their reasons for choosing something or way of approaching a situation. Carmella chose to take a cruise line instead of an airplane on her route home, and she had good reasons for taking a mode of travel frequented by package tourists.

"I am on a boat because I was interested in trying something unique and this came up as a pretty good deal. For me, this was an alternative to flying across the Atlantic. Crossing it by sea was a form of travel I had not tried and reminded me of the early explorers tho I am sure they had it very different than a cruise lifestyle. You can see many places in a short time though you really can not spend much time as you only have one day. I had the time and it was not a whole lot more expensive than flying. I have cruised in the past and am no longer excited about going in circles as most cruises routes do. But using it as a form of transportation interested me."

"I have used the opportunity to speak to many passengers (mostly from United States) about their country and opinions. I have also learned a lot from the crew who happen to come from all over the world (usually less fortunate countries). I am sure there are not many backpackers aboard and find the exposure to the different demographics interesting. There are many extremes and contrasts here."

When Carmella returned home she experienced some of the culture shock and contemplation which is common for people returning after long periods of time. In the following entry she described her thoughts after arriving to stay with a friend at home.

"I slept pretty well although I still had a feeling of surreality through the next few days. I located some stuff that I had stored from before my trip and packages of stuff I had sent home. I had several time capsules to open. I let it all explode in my room thus beginning the long and emotional task of organizing my 'stuff.' I sorted through clothes I have not seen for years, remembering the last time I wore them."

"I came across the clothes I had first used in the beginning of my trip. I inspected them carefully remembering the wear and tear fondly. They felt like ancient artefacts from a life previous as they seemed to have a special energy. I decided what would retire and what would be amalgamated into my new wardrobe. It was quite the process as I would sometimes get choked up with the overlapping feeling of the old and new. It felt like introducing deep-rooted solidity to a magic light freshness. It seemed to create a floating like feeling as they mingled together. It is a strange space. Nostalgic and poetic."

It is difficult to travel without thinking about what one is learning, and how it will influence the rest of one's life. This type of introspection often leads to personal philosophies of travel which explore the collective experience of large numbers of backpackers. Carmella commented on this below.

"Travel seems to expand ones awareness and is a powerful tool in understanding the world in which we live. Perhaps the more people who do it, the higher the levels of tolerance and understanding [that] will be reached. One of my favourite quotes is by Albert Einstein. 'Peace cannot be kept by force. It can only be achieved through understanding.' I see that the trend is moving towards longer periods of travel and certainly technology has enabled us to live more mobile lives."

I also asked her about that perfect shoe she was looking for when she left home.

"Did I find the perfect shoe? I learned that nothing is perfect forever but some things are perfect in that moment. And in that moment, yes, any shoe that would take me from here to there comfortably was good in my eyes."

Carmella's travel blog is available to the public at:
http://www.travelpod.com/members/whereshegoes

Towards the end of my Ph.D. candidature I was backpacking in Japan and reflecting on some of Carmella's insights as well as the conclusions of my own research studies. Many situations arose while travelling which underscored the need for better tools for travellers. However, one particular excerpt from my diary stands out as an example of the everyday problems of budget travellers and the role better tools could play in improving the travel experience.

A native English speaker, I am only competent to utter two phrases in Japanese: konnichi wa (hello) and arigatō (thank you). With regard to my research, a particularly relevant experience occurred upon my arrival in Sendai. It was raining outside, threatening to get dark, and I was getting hungry. Sendai is a large city with train, subway and bus systems.

The tourist office was closed, and for some unknown reason my guidebook only listed three budget hotels, in vastly different parts of the city. After stumbling out what I hoped was the proper subway exit into the pouring rain (taxis are outrageously expensive here), I began trying to locate my chosen ryokan (Japanese bed and breakfast) on foot. It was nowhere to be found.

Street names on the map were in the Roman alphabet while street signs were in the Kana alphabet. Additionally, streets were omitted from the map, but I was fairly sure I was in the right location. I resorted to asking at local coffee shops and hotels. Imagine trying to get directions in a language you do not speak with street names you can not read.

Needless to say, after another hour of walking in circles it was dark, I and my pack were soaking wet, and I checked into a hotel offering rooms at three times my normal budget. This was a smart move. It turns out the ryokan was out of business and there was no certainty the others listed in the guidebook were not either. Calling ahead does not work well when you do not speak Japanese and your GSM mobile phone does not work in Japan.

Viewed from a design perspective, a number of things could have helped. Accurate information, a simple way of contacting the hotel while on the road, comments posted by recent travellers, an accurate map switching between Japanese and anglicised street names (and showing current location), more extensive listings, and many more solutions come to mind. *Observing the problems backpackers experience uncovers requirements and generates design ideas*. This thesis addresses this by exploring

methods of studying backpackers, and the broader category of mobile communities. These methods can be used to provide solutions for the practical daily difficulties of travelling, such as I and others have experienced. Hopefully when we travel in the future there will be mobile tourism technologies available which help to smooth out the bumps we do not like and help us find the ones we do.

To all those who have provided intellectual

and physical assistance on the journey

1 Introduction

Ford handed the book to Arthur.

"What is it?" asked Arthur.

"The Hitchhiker's Guide to the Galaxy. It is a sort of electronic book. It tells you everything you need to know about anything. That is its job."

Arthur turned it over nervously in his hands.

"I like the cover," he said. "Do not Panic. It is the first helpful or intelligible thing anybody's said to me all day."

- Hitchhiker's Guide to the Galaxy (Adams, 1979, p. 52)

This research relates to methodological issues surrounding the development of mobile devices for mobile groups and communities. More specifically it addresses backpackers, who are a relevant example of this type of community. Society is increasingly mobile (Clifford, 1997), mobile devices are commonly being used to coordinate group actions (Ling & Yttri, 2002), and group communication features are being added to existing technologies (Tang et al., 2001). Despite this, little is known about how mobile groups act or how communications technologies should be designed to augment existing behaviour. This is partially due to minimal research being done on the topic, but also to the lack of research methods available to study the topic with. Mobile groups are challenging to study because of frequent and long-duration movement, frequent distribution, and the rapidly changing environments they operate within.

This research investigates the convergence of CSCW and mobility (see Section 1.2), and thus relates to the determination of appropriate methods for designing to support interaction within groups that move. Traditional methods within the computer supported cooperative work (CSCW) field primarily evolved to look at stable group

interaction in work settings. With the advent of mobile computing and increased interest in other research domains such as leisure, these methods will need further adaptation. CSCW has long advocated in-situ research and ethnographic methods (Anderson, 1994), and it is the application of these methods to study mobile groups which is explored in this thesis. The studies presented here have adapted diary studies, cultural probes, shadowing and prototyping to develop methods which are more suitable for the physical and social environments of groups. The design of my studies is also exploratory, which diverges from the tendency in mobile development research to focus on the technologies being used and to do more formal evaluations using advanced prototypes. Furthermore, this thesis work focuses on product conceptualisation, early requirements analysis and preliminary investigation of physical designs.

Backpackers have been used as a case study for the methods because they are a vibrant example of a creative and growing mobile community with an energetic style of communication. It is these types of mobile groups who are not being addressed by current mobile phone designs because of the emphasis they place on historically relevant one-to-one communication paradigms (Axup, Viller, & Bidwell, 2005; Lacohée, Wakeford, & Pearson, 2003). This thesis concludes that there is a strong potential for devices to arrange in-person meetings, coordinate group activities and share travel wisdom between backpackers. Another issue is that it is difficult to visualise or understand the behaviour of groups of people. Sociologists have turned to using social network graphs as a way to assist in analysis and communication of results. This approach has been adopted here as well, and several studies use these graphs to help explain results.

The outcomes of this thesis roughly fall into categories relating to methods, technology designs and backpacker culture (see Section 1.3). Methodological outcomes include new methods for studying mobile groups, advice on how to use multiple methods effectively, and theoretical contributions for understanding mobility and mobility research. Technology design contributions include 37 product ideas (see Appendix C) that resulted from user observation and feedback as well as the preliminary evaluation of various design concepts. Contributions have also been made to what is known about backpackers, and this has been used to form numerous product requirements and visualisations of their community behaviour. It is intended that this research will assist both future researchers and developers of mobile group technologies. It is also hoped that it will prompt development of mobile

tourism assistants such as the Hitchhiker's Guide to the Galaxy, which can effectively offer advice and peace of mind to adventurous travellers.

1.1 Research Question

The research presented in this thesis primarily addresses research methods for supporting mobile communities. The formal research question for this thesis is:

What research methods can improve support for the conceptualisation and design of new mobile devices which support mobile communities?

There are a number of challenges in the fields of mobile development, computer supported cooperative work (CSCW) and leisure studies which are relevant to the research question:

A. **Difficulties applying traditional CSCW methods to understand mobile groups** because of method structure and challenging circumstances (Weilenmann, 2001a) (see Section 6.1),

B. **A lack of guidelines or guidance** for how to choose, adapt and combine methods to produce useful results (see Section 6.2),

C. **A deficit in research that addresses early phases of development** such as conceptualisation and low-fidelity prototype evaluation in natural environments (Carter & Mankoff, 2005; Kjeldskov & Graham, 2003) (see Sections 2.4.1, 2.5.6),

D. **Continued difficulty in translating ethnographic accounts** of mobile users into user requirements, and documenting them for design teams (see Sections 2.4.2, 2.4.3),

E. **Mobile research which is heavily technology-focused** and is not led by real user requirements or situations (Goel, 2002; Pospischil, Umlauft, & Michlmayr, 2002) (see Section 2.3.3),

F. **A lack of understanding of how mobile communities operate** and how mobile devices should be designed to facilitate groups instead of just individuals (see Sections 2.1.4, 2.3.1, 2.3.3),

G. **Little knowledge of how tourists travel** (Brown & Chalmers, 2003), the technologies they use, or how introduced technologies will change existing behaviour (see Sections 2.2.5, 6.7), and

H. **Reports that low-budget tourists make extensive use of ad-hoc travel advice from other travellers, but face barriers to meeting locals** and corresponding opportunities for cultural exchange (Huxley, 2005); this situation may benefit from technological assistance (see Sections 3.4, 3.6).

The path of finding solutions to these problems has led the research primarily into the disciplines of mobile devices and CSCW, but also into a range of related areas.

1.2 Disciplinary Context

The research primarily explores the convergences of CSCW with the field of mobile device development. This takes the emphasis of CSCW on designing technologies for groups and considering social implications, and applies it to mobile device designs and mobile settings. This convergence is demonstrated in Figure 1.

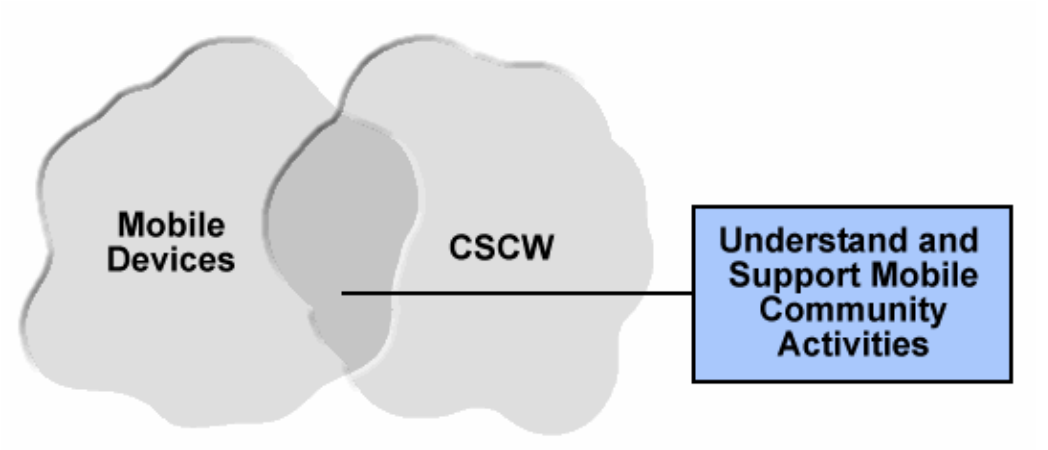

Figure 1: The merger of mobile device research and CSCW research.

This research breaks new ground in the combination of these two areas, pushing both fields to explore what mobile groups are, how they behave, and how this changes how we design for them. Mobile devices are rapidly gaining group features

(see Section 2.2.2) and it is an opportune time to develop methods to support their development.

While mobile devices and CSCW are the primary disciplines focused on in this thesis work, there are a large number of related disciplines which relate to these fields, and which are addressed to some degree in this thesis. Figure 2 shows an approximate representation of the more important peripheral disciplines. There are many other disciplines which are not shown, and in some circumstances all of the fields depicted overlap. This visualisation simply attempts to convey how interdisciplinary the field is, and how rich the theoretical and methodological resources are which this research draws upon.

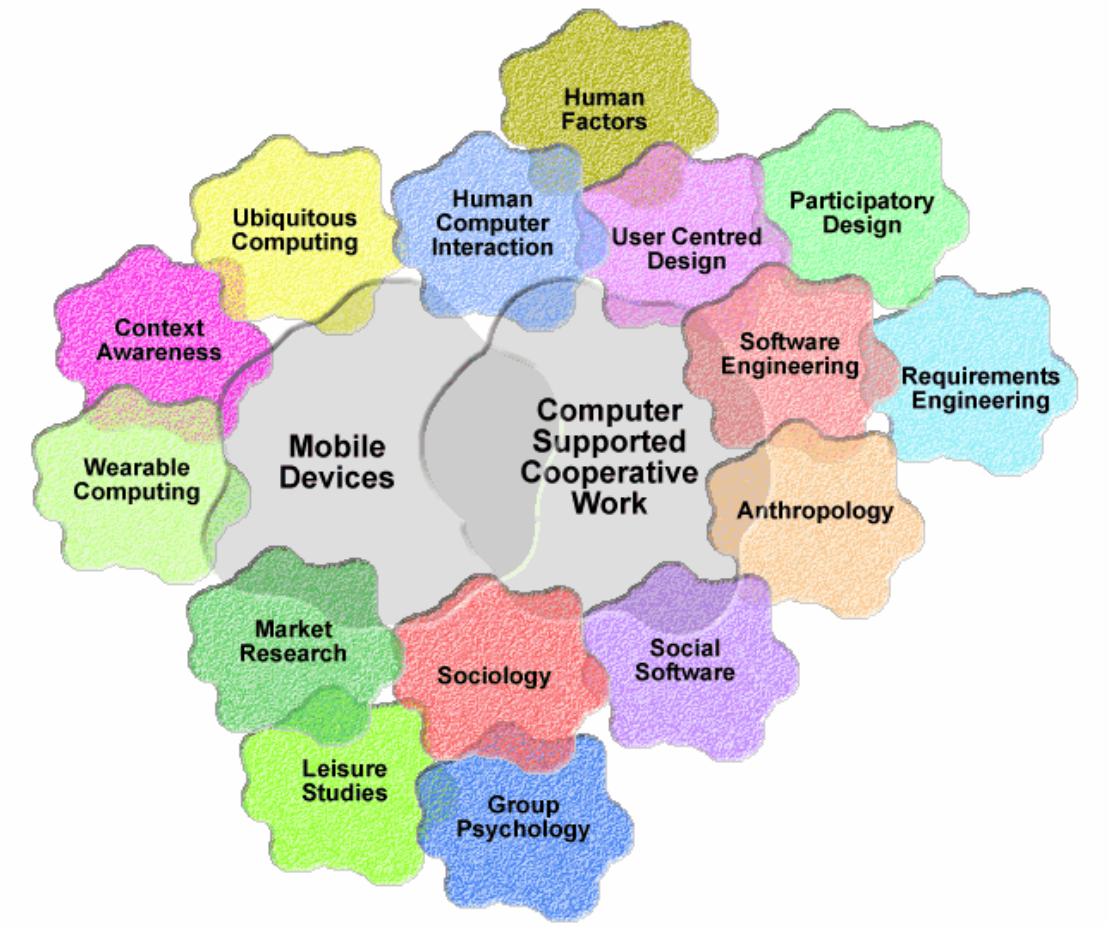

Figure 2: Academic disciplines surrounding the primary area of interest.

The following list briefly covers the general purpose of these research areas for those readers unfamiliar with them.

- **Human computer interaction (HCI)** is a broad field looking at the psychology of technology usage and the interface designs which mediate human contact with computers.
- **Human factors** looks more specifically at the cognitive, ergonomic, and performance aspects of this.
- **User centred design (UCD)** is a design theory with corresponding methods which broadly advocate user involvement (see Section 2.5.1).
- **Participatory design (PD)** is a design theory and a set of related methods which advocate more extensive user involvement in design and a political stance advocating worker rights (see Section 2.5.3).
- **Software engineering** is a more formal field which deals with the construction and architecture of computer software.
- **Requirements engineering** focuses on understanding what a system needs to do and confirming that it is building to these specifications (see Section 2.4.2).
- **Anthropology** is the study of cultures and commonly uses ethnographic methods which are applicable to understanding design settings (see Section 2.5.2).
- **Social software** is a new field which is concerned with building groupware applications that integrate social networks and profiling information (see Section 2.2.3).
- **Sociology** is a broad field looking at the behaviour of groups and communities (see Section 2.3.1).
- **Group psychology** is similar, but looks at how the psychology of individual members combine to form group behaviour at a more detailed level.
- **Market research** is a broad field which seeks to understand the needs of potential customers for application in product design and advertising (see Section 2.6.1).

- **Leisure studies** tends to be sociological research applied to groups of people on vacation or being entertained (see Section 2.1).
- **Wearable computing** is a recent field looking at how small devices can be continuously worn and proactively provide information to their user, often through atypical input and output methods.
- This is related to **context awareness**, which is a nebulous field including different types of researchers interested in understanding the environment and potentially using it to change device behaviour (see Section 2.5.7).
- **Ubiquitous computing** (ubicomp) is focused on imbedding computers in the environment and erasing interfaces with users, and are also heavily concerned with context awareness (see Section 2.2.5).

1.3 Focus and Outcomes of the Thesis

The major outcomes of the thesis lie in three areas (see Figure 3):

1) **methods**,
2) **technology designs**, and
3) **backpacker culture**.

The thesis primarily concerns *methods* for developing mobile devices for mobile groups. However, methods which are to be used to design technologies must also help produce effective *designs*. They must also produce a great deal of knowledge about the user population being designed for, which in this case is *backpackers*. Thus it is a necessity for the research to have outcomes in all three areas and for some of these to overlap.

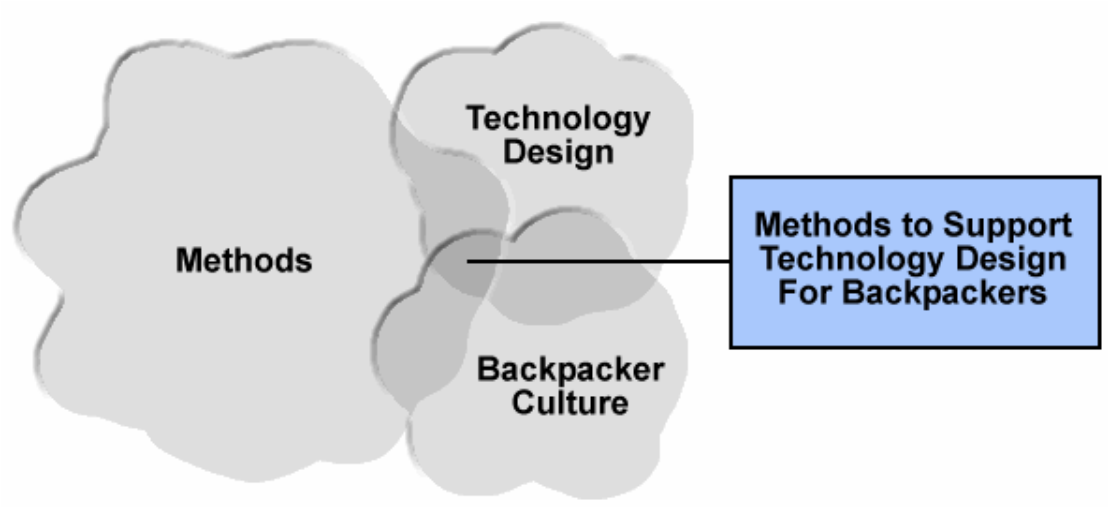

Figure 3: Primary outcomes of the thesis are related to methods, but also to technology design and backpacker culture. Thus it is the convergence of these areas that most clearly defines the focus of my research outcomes.

The following results have been achieved as a product of the doctoral work. They are structured around the three areas mentioned above and depicted in Figure 3.

1) Methods

- **New participatory and ethnographic research and design methods** for studying mobile groups. These methods have been trialled, and recommendations are made for further method development by mobile device researchers (see Chapter 3, Chapter 4). Results lend support for increased usage of studies with the following characteristics:
    - **In-situ**: Doing studies in reasonably natural environments (see Section 6.6).
    - **All-inclusive groups**: Studies which track all members of a group (see Section 2.6.5).
    - **Exploratory**: Flexible studies used early to develop ideas and early requirements (see Section 2.5.6).
- **Method Templates**. These patterns have been provided to encourage dissemination of the mobile group methods used in this research, and to simplify their usage (see Sections 4.4.3, 4.5.4, 4.6.4, 4.7.4). They have also been provided as downloadable PDFs.

- **Demonstration of why using multiple methods to triangulate** on important requirements is beneficial for mobile community research (see Section 6.3).
- **Two new taxonomies with which to understand existing mobile device research.** These help to identify 'extreme mobility' as differentiated from other forms, and different types of mobile research structure (see Section 2.5.10 and Section 2.6.5).
- **Determination of significant factors affecting structure of prototyping studies** (see Table 7).
- **Determination of key categories of observations leading to requirements.** These are 'situations of consequence' which can be categorised as questions, problems, fun, desire, intent and common occurrences (see Section 4.4.2.2).
- **Visualisation methods for portraying and analysing mobile group behaviour.** Some of these are 'reconstructions' (similar to vignettes) which recreate actual events and scenarios which are grounded in observed events (see Section 2.4.3, Figure 109, Figure 110, Figure 111). Also see other related visualisations (Figure 108 and Figure 114).

2) Technology Designs

- **New tourism product ideas**. Seven concepts have been prototyped and partially validated by users and industry. Additionally, 57 mobile tourism product ideas have been generated, as well as the structure of a social pairing system for backpackers (see Section 4.8, and Appendix C).
- **A format for conveying product concepts** has been developed and iterated with an industry partner to assist explaining concepts to industry (see Section 5.1.1).
- **A design concept for a wearable note taking system**, which would help mobile group researchers conduct shadowing and simplify resulting data analysis (see Figure 112).

3) Backpacker Culture

- **Requirements of backpackers and other mobile communities** for mobile devices which provides insight into backpacker culture. Lists of these have

been mentioned after each study and all 59 are listed together in the Appendix (see Appendix B).

- **New visualisations which show backpacker behaviour and social networks** to assist analysis and enable communities to visualise themselves (see Figure 99, Figure 102, Figure 103, and Section 3.8.2).
- **Design tensions have been identified**, which show opposing needs of backpackers that should be considered when designing for this group of users (see Figure 85).

1.4 Intended Audience and Document Structure

Since the primary focus of the thesis concerns methods (see Section 1.3), the target audiences are:

1. practitioners and developers seeking appropriate methods to help design mobile products,
2. fellow researchers in the area of mobile community design wishing to review new research in the area,
3. thesis examiners, media and members of the general public interested in tourism technologies, backpackers or mobile group research.

I have made an attempt throughout my candidature to ensure that my research is practical and useful to those doing research, while also maintaining a solid theoretical foundation. This practical focus is demonstrated in several sections of the thesis. These include the lists of requirements and design ideas at the end of selected studies and Chapter 4 which is devoted to realistic use of methods and recommendations for using them. It is hoped that these will make it easier for practitioners to adopt these methods in a useful fashion.

Design and prototyping are visual activities, and attempting to convey large visuals or interactive prototypes via a PDF or paper is not a reasonable option. I have also avoided producing the thesis on CD because of the delivery issues. The most simple solution was to provide links to the full-size images and animations on the web. This has been done, and in selected areas of the thesis there are comments reading “A larger version of this image is available at location.” Clicking the hyperlink will lead

directly to a full-size image or animation. A PDF of this thesis and electronic versions of selected images are available at http://share.userdesign.com/thesis. A backup version is also available in PDF format at: http://eprint.uq.edu.au/archive/00003981/.

This text uses Australian English, except in direct quotes taken from written sources where other forms were used. Symbols are used in the thesis in the following manner. “Quotes” signify a direct quotation of a participant or written work. [Brackets] usually indicate a correction or clarification made within a quote by the author. ‘Apostrophes’ denote a word or phrase that has special significance. *Italics* are used to emphasise certain parts of sentences. **Bold** text is sometimes used to show high level summaries of concepts in lists.

1.5 Overview of Thesis

The structure of this thesis uses a reasonably traditional research paper format. It begins with a literature review, followed by a methods chapter reviewing all of the study results. After this, there is a chapter discussing practical details of usage of the methods introduced in the previous chapter. To supplement methodological outputs, this is followed by a chapter which specifically addresses design outcomes and industry response to the research. A discussion chapter and conclusion make up the remainder of the thesis. A more detailed overview of each of the thesis chapters is provided below.

Literature Review (Chapter 2): The literature review is structured to begin with broad social issues and current technologies, then moves into high-level development issues, and concludes with more detailed methodological issues. The review of the literature begins with backpacker habits and identity. The origins of travel are discussed, along with typical activities, culture, and their relevance to the design of mobile tourism technologies. This is followed by an overview of the technologies they are currently using (e.g. SMS, blogs) as well as related technologies and research projects (e.g. Bluetooth, IM) which will likely support future designs. The subsequent section covers themes in mobile and CSCW research such as collective usage, social networks, and current problems. The section after this discusses related development activities such as conceptualising products and requirements engineering. Related design theories and frameworks are introduced in the following section, which includes user centred design, ethnography and

participatory design. This sets the stage for a look at some of the more commonly used mobile group methods in the concluding section.

Research Studies (Chapter 3): This is the methods chapter which covers all five studies conducted, their results and discussion of issues pertaining to each. It begins by introducing the scope for the thesis and the rationale behind the methods used. It also provides a framework for how the methods used covered multiple aspects of the design problem. The studies are as follows:

- **Site Survey and Interviews**: with backpackers in hostels,
- **MIS**: backpackers talking and using prototypes on a tourist trip,
- **Social Pairing**: exercises simulating a system of social ties for travellers,
- **Contextual Postcards**: sampling backpackers' situated opinions, and
- **Blogs**: analysis of paper and electronic travel diaries.

Practical Use of Methods (Chapter 4): Since this thesis is primarily about effective use of methods for designing for mobile groups, this chapter is devoted to practical considerations while using methods. The methods introduced in the previous chapter are individually reviewed. The method is briefly restated, then use of the method is reflected upon, and recommendations for its use are made. Some of these sections have 'method templates' which assist the reader in trialling the methods and to encourage distribution to others.

Additional Research Outcomes (Chapter 5): This chapter is a brief review of design concepts and industry responses that resulted from the research. The design concepts include tourism product concept sheets, an interactive phone-based prototype, a social pairing system prototype, and the MIS mobile product concepts.

Discussion (Chapter 6): This chapter covers high level topics which pertain to more than one study, or broader methodological issues. The discussion primarily pertains to effective selection, adaptation, and use of methods. It begins with a discussion of how applicable traditional mobile and CSCW methods are for studying mobile groups. This is followed by sections on choosing methods and using multiple methods to triangulate on answers. Then, details of methods are covered including the utility of using visual representations of ethnographic results and the advantages of in-situ methods. The chapter ends with a longer discussion of how design theory

affects human behaviour, and what social responsibility designers have for creating a humane future.

Conclusion (Chapter 7): Concluding remarks are given that relate to the original research question and how it has been addressed. It also reviews the entire thesis, applicability of the results, and future avenues for related work.

2 Literature Review

Due to the multidisciplinary nature of this research, my review of existing literature covers broad issues from a range of fields including: computer science, HCI, sociology and leisure studies. The chapter is structured to first begin with high-level cultural and technological issues in the area of designing for mobile communities, and then moves towards more detailed theories and methods used in technology development.

The first section discusses backpackers: where they have originated from, how they act, what their culture is and why this relates to tourism technologies. After this is an overview of technologies related to tourism or mobile development such as SMS, blogs and mobile social software. This is followed by a segment on broad themes in mobile and CSCW research: community interaction, group usage of mobile phones, and current methodological problems. After this is an overview of development activities for which theories and methods are used such as product conceptualisation and requirements engineering. Following on from this, the next section covers theories and frameworks such as user centred design, ethnography and participatory design. The chapter concludes with an overview of methods commonly used in mobile and group research, which includes diary studies, probes and prototyping.

Broadly speaking, this literature review provides insight into the people who I am designing for, a review of relevant theory and methods, and an overview of related technologies which are either being researched or currently on the market.

2.1 Backpackers and Mobile Communities

It has been argued that we are rapidly evolving into a culture of mobility (Clifford, 1997) and tourism (Urry, 1990) where movement is a regular part of life and the world is increasingly small and interconnected. While even small villages have always had a degree of connectivity both within and without them due to business, familial and friendship ties, this is now expanding. Arguably, the world is becoming

more connected and fluid than it was. It has been demonstrated that communities which used to be largely geographically bound are now 'glocalised' and consist of distributed members, with larger numbers of people connected by weak ties (Hampton, 2001). Individuals are often part of many different dispersed communities (both offline and online) which are connected by a variety of technologies (Foth, 2004).

In accordance with this, some observers have indicated that our society increasingly has a 'restless mobility' to it (Richards & Wilson, 2004). Thus, the normal life stages that individuals go through are increasingly taking place in a mobile setting, which challenges the individual with new activities, customs and lifestyles. An interesting component of this is the increasingly popular activity of backpacking. This form of budget travel is different from wilderness hiking or trekking which commonly goes by the same name. Backpacking[1] increasingly refers to younger people who travel on small budgets for long periods of time as part of an exploratory part of their lives. For many backpackers, the time spent travelling will be a period of extreme mobility before they eventually choose more stable situations to build careers or find homes. Consequently, examining what technologies could be used to support this highly mobile community may provide insights into design issues which will shortly be relevant for an increasingly mobile society.

This section begins with a review of the history and behaviour of backpackers, followed by a discussion of the culture they develop, and concludes by exploring how mobile device research applies to them. Before continuing, it is important to note that backpacking is a worldwide phenomenon; however the research in this thesis focuses on backpackers in Australia and travel in other countries is only mentioned when relevant.

2.1.1 Grand Tours and Travel on the Cheap

Backpacking has recently gained wide popularity, but it has roots going back as far as four centuries ago. During this period younger people of sufficient wealth sometimes went on a 'Grand Tour' of foreign countries as part of their education and

[1] The term 'backpacker' in this research refers to the common international definition of younger budget travellers in both urban and rural environments, and not the US definition which refers primarily to hikers and campers in rural environments.

for entertainment (Hibbert, 1969). Extended periods of travel were not restricted to the wealthy, however. Tramps or hoboes were a form of itinerant workers in many different countries. They moved regularly and travelled cheaply because they were poor. In the 1800s in Australia these people were known as 'swagmen' because of the 'swag' or durable sleeping bag they carried with them. With the rise of the standard of living in many countries it became more feasible to take vacations. Sometimes these trips covered long distances and durations. Thus a mixture of education, employment, entertainment and relaxation formed a foundation for more modern travel trends (Hyde & Lawson, 2003).

Hitchhiking has long been a method of getting cheap transportation and has some similarity to illegally riding in train boxcars as hoboes had done. Various transportation options were increasingly accessible to the middle class and not just the rich and well educated. The hippie movement in the 1960s encouraged less traditional lifestyles and resulted in many young people visiting foreign countries inexpensively. Some also became 'drifters' who continually moved looking for employment and resembled itinerant workers during the 1930s Great Depression. Sometimes this was due to necessity but it often reflected a desire to avoid mainstream society, be independent and see how others lived (Ateljevic & Doorne, 2004). Throughout this period it became more common for younger people to embark on longer trips for many of the same reasons as their predecessors. More recently many countries have opened hostels[2] and inexpensive lodging to support this form of tourism.

2.1.2 Behaviour

Backpackers have been described as "travellers who exhibit a preference for budget accommodation; an emphasis on meeting other people (locals and travellers); an independently organised and flexible travel schedule; longer rather than brief holidays; and an emphasis on informal and participatory recreation activities." (Loker-Murphy & Pearce, 1995, p. 830-831). Backpackers in Australia primarily flow in a bi-directional North-South current along the East coast (see Figure 4) where most of the tourist attractions and major conurbations are located (Loker-Murphy & Pearce,

[2] Hostels in Australia and other countries are often colloquially called 'backpackers'. To avoid confusion in this text, backpackers will refer to people, and hostels to accommodation, with the exception of direct quotes from backpackers who may use the other meaning.

1995). It is easy to forget the huge scale involved when talking about travel in Australia: the island continent occupies a landmass which is comparable to the size of mainland USA, or continental Europe.

Figure 4: Map of Australia showing major locations (from www.lonelyplanet.com). The East coast has the majority of the backpacking traffic along it between Melbourne and Cairns.

Budget accommodation normally consists of hostels or inexpensive hotels, which typically offer some form of shared sleeping, eating and entertainment facilities. Estimates vary, but many backpackers to Australia do not make significant plans or bookings for their trips before arriving and advocate this to other backpackers. The primary exception to this is airline tickets which require bookings; nearly half of these are only booked 0-2 months in advance (TNT Magazine, 2003). Various researchers have found the average time spent in Australia to range from 2-6 months (Slaughter, 2004) and trips to Australia are frequently a portion of larger trips to New Zealand, South East Asia, Indonesia and other countries. Backpackers often seek informal work as they travel and engage in activities such as trekking, scuba diving or ridesharing outside of the time they spend working. Tourism Queensland estimates that backpackers represent 10% of all visitors to Australia and that this is increasing (Kjeldskov, Skov, Als, & Høegh, 2004; South Australian Tourism Commission, 2004). Backpackers are part of the larger tourism market which also includes, for example, package tours, food and wine tourists, and family holidays.

Backpackers frequently stay 2-3 nights in a location although some locations are a one night bed in-between stages of transportation, or a stop to work for up to several months (Ballen, 2004, personal correspondence with hostel owner). Frequent movement results in a lifestyle of continually meeting new people. A recent study indicated that 42% of backpackers in Australia arrive alone (Ballen, 2004). Many others travel with a partner or friend. Larger groups are uncommon although backpackers occasionally travel with others they meet for brief periods. Organised backpacker bus services travel between common backpacker destinations and cater to a younger, partying crowd. More independent travellers use standard bus services or other forms of travel such as planes, trains or shared cars.

The prototypical backpacker is open-minded, well travelled, able to travel frugally, knows how to have fun, and goes places other tourists do not. They are a bit daring, find locations only locals know about, and travel for years at a time. Real purists do not plan anything, do not carry mobile phones or cameras, and enjoy being isolated from familiar people and cultures. The fact of the matter is that very few backpackers reach this ideal definition. A large percentage of backpackers are on university breaks or taking a year off between high-school and university (referred to as a gap-year) (Huxley, 2005). Most have not travelled much before, and many do not ever return to where they are currently travelling (Newlands, 2004). Many of them want to party, and hostels often have their own bars or have connections with local pubs to facilitate this. Many backpackers like companionship and safety, choosing to stick to the well-trodden paths and backpacker enclaves. Backpackers are increasingly older, and often have more money to spend on advanced technologies which are carried with them. They also rarely go to untravelled locations; good tourist locations are often well known and thus attract all types of tourists, including backpackers.

2.1.3 Culture

There has been a modest amount of sociological research on backpackers which provides insight into typical environments and social norms of backpackers. One Australian study discusses the duration of travel, lifestyle, goals and movement patterns (Loker-Murphy & Pearce, 1995), and a recent book discusses international differences and backpacker culture (Richards & Wilson, 2004). Backpackers bring aspects of their own cultures with them when they travel. The destinations they visit can change in response to this cultural presence, and thus loose the authenticity which was the original reason for travel (Richards & Wilson, 2004). Many foreign

cities have a portion of the city dedicated to supporting the backpacker trade. It is argued that it is becoming harder for “real” backpackers to find anywhere off the beaten track given the number of travellers going to remote destinations (Richards & Wilson, 2004). However, the regular stream of backpackers brings a steady income for locals who cater to them. Internet cafes which are supported by foreigners wanting to contact home, also result in the availability of inexpensive communication tools for local community members. Despite the changes they introduce, it is still interesting to note that backpackers still have opportunities to learn and adapt to local customs (Huxley, 2005).

Backpackers are often highly social and commonly talk to other backpackers and locals that they meet. This is frequently necessary to avoid getting lost, find objects of interest or simply provide entertainment. Travel and personal issues are common topics of discussion. Trust tends to be high because of shared circumstances, interests and personal characteristics. Thus many backpackers leave personal items out in shared dormitories without worrying about losing them – but theft does occasionally occur. Gossip about good and bad locations, tour operators, hostels, transportation and many other topics are common. Huxley indicates that “The network of travellers and the information that they share has created a global backpacking culture that enables travellers to satisfy their goals…” (Huxley, 2005). Backpackers spend a great deal of time in situations that can be boring: waiting for transportation, not knowing anyone, or simply resting between activities. This results in an environment where most backpackers have time to talk and are often interested in learning about the people they meet. Backpackers often learn to be good storytellers to entertain those that they meet. Consequently it is fair to say that there is an element of exaggeration and fiction which experienced backpackers learn to judge. Personal or highly philosophical topics are not uncommon, in part because of the vastly different cultures which are sometimes encountered and the introspection that often accompanies this. Another factor is that anonymity and frequent movement reduce the likelihood of sensitive information being passed on to inappropriate people.

Many backpackers in Australia enter on working holiday visas which permit limited periods of employment. Consequently many look for agricultural work such as picking fruit, labouring, nursing or other temporary positions. There is also a program called

WWOOF (willing workers on organic farms[3]) which brings backpackers to small rural locations to help with farm work. Australian cities are primarily along the coasts and many of the popular locations are along the East coast. Consequently backpackers tend to travel North or South along the East coast beach towns, occasionally going into the hinterland (inland smaller towns).

Finally, it should be noted that backpacking in Australia is similar to other developed countries. Some differences include a developed tourism culture which extensively caters to backpackers; a large percentage of English backpackers on gap-year; and that Australia is geographically a very large country with well distributed tourism sites.

2.1.4 Relevance to Designing Tourism Technologies

The primary methods backpackers use to choose travel destinations include consulting paper guidebooks, and making enquiries with hostel staff, information centres and other travellers (Newlands, 2004). These established methods and technologies for finding out about a travel destination are rapidly being augmented by digital cameras, mobile phones, e-mail, travel blogs and other communication and recording devices (also see Sections 3.4.2.16 and 3.5.2.4). Many backpackers enter a location viewing it as a “once in a lifetime experience” where they want to see as many things as possible before leaving. However, currently available offline methods such as hostel bulletin boards, happenstance discussions with other travellers, and selective advice from travel offices or guidebooks are often insufficient. This can result in travellers missing opportunities that may never be available to them again. Some research has explored the design of electronic travel guides, but much of this research has technological aims and a poor understanding of the actual needs and environment of travellers (see Section 2.2.5).

Backpackers represent a particularly challenging group of travellers to design with for a variety of reasons. They are a distributed community where individuals or small groups move frequently and for long duration, but also pause occasionally to work or enjoy particular locations. They often engage in adventurous activities and use mobile technologies in demanding environments. Also, backpackers represent a wide range of nationalities, and exchange information in an ad-hoc manner as they move

[3] Taking part in the program is called ‘wwoofing’. Also see: www.wwoof.com.au

(Riley, 1988). Many of them never meet each other although they share common needs, such as finding inexpensive transport or accommodation, where collaboration could be useful (Huxley, 2005). Methodological challenges raised by designing for/with backpackers include: the need to study people who are travelling long distances, analysis of large distributed group interactions, and determination of technologies that are compatible with a distinct type of lifestyle and culture which only insiders understand well.

Despite these challenges, it is clear that new mobile tourism technologies will find niches in the backpacker market, as they are already doing. Thus methods do need to be found to develop successful and useful devices for this market. Theory and methods currently used in mobile device and computer supported cooperative work (CSCW) research are the likely building blocks for future methods and theory to support development of travel technologies for backpackers and other mobile communities.

2.2 Overview of Related Technologies

There are a variety of technologies which could be used to support mobile communities, but actual technology implementations are outside the scope of this thesis. However, in the design process it is useful to review similar products and research concerning relevant product concepts. It is also necessary to verify that there are technologies available to support proposed designs. Many of the technologies mentioned are currently available as commercial or open source products. This review will necessarily soon be out of date as new versions are released. It is also not meant to be comprehensive, but to give a broad understanding of related technologies and products. With the decreasing size of many technologies, and with the diverse activities of backpackers, it is necessary to touch on a variety of products. This section begins with a discussion of mobile phones, then mobile group communication tools, followed by mobile social software. After this, overviews of navigators, visitor guides, cameras, MP3 players, blogs and networking technologies will be provided.

2.2.1 Smartphones, PDAs, UMPCs, Communicators

Mobile phones are rapidly merging with other previously distinct products such as personal digital assistants (PDAs), laptops, MP3 players, walkie-talkies, and radios. New phones such as the Nokia 9300i communicator has Wi-Fi networking, web access, e-mail and a keyboard, which were previously provided only by desktop computers. The Sony Ericsson 9500i supports MP3 playback as well as video-conferencing via a digital camera. Push-to-talk was introduced in the Nokia 5140 which permits instant voice communications with individuals or group after a button press. A variety of other technologies including digital compasses, flashlights, movie-recorders and GPS positioning have also been included in some models. Clearly, convergence of devices is both a goal of manufacturers and is rapidly becoming feasible.

PDAs are handheld tablet computers which became common after the popularity of early electronic organisers, the Apple Newton in 1992, and Palm Pilot PDAs in 1996[4]. Early versions primarily handled the functions of an electronic organiser such as a calendar, notepad, and address book. New versions such as the HP iPAQ hw6515 offer a thumbboard, GPS positioning and mobile phone functionality in addition to traditional PDA functionality. Most support pen-based entry and have larger screens than phones. PDAs and larger tablet computers are merging in a new Microsoft standard called the ultra mobile personal computer (UMPC)[5]. It provides basic specification guidelines for the development of medium-sized tablet computers with screens of approximately 20 inches, which run a standard Windows operating system and have wireless capabilities.

New naming conventions are also emerging among small devices. For example, ‘Communicator’ is a new naming convention for mobile phones which both reflects additional networking technologies and input mechanisms, but also a broadening of the scope of the phone [6]. Phones are no longer just about calling, talking, or

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[4] en.wikipedia.org/wiki/Personal_digital_assistant

[5] en.wikipedia.org/wiki/Ultra_Mobile_PC

[6] For examples see:
www.infosyncworld.com/eu/productguide/?cat=Mobility&cat2=Communicator

necessarily having discussions. They now support brief messages, text-based communication, group conversations and data transfers among other operations.

Many new mobile phone technologies are expensive and many of the features are technology-led. For example cameras were placed in phones without a good idea of how they would be used. MMS (for sending photographs to others), video (for recording movies and video calls) and WAP (for Internet access) have all had poor customer response due to usability and utility concerns. However, some recent technologies are popular (e.g. SMS, cameras used for taking and storing photographs). As new technologies become cheaper and standard they are easier for the youth and economically disadvantaged to acquire. It is likely that four communicator technologies will be particularly relevant for mobile communities in the near future; these are:

- **Bluetooth** (which provides short-range networking such as within a room),
- **Internet access** via GPRS/EDGE (which provides e-mail, instant messaging, data transfer, and other communication options),
- **high-resolution cameras** (which can be used to document experiences), and
- **better text entry methods** such as thumbboards (which permit increased usability for extended messaging and photo annotation via a keyboard).

There are a range of other factors which affect the success and utility of these products including pricing of phones and usage rates. In particular, inexpensive Internet access, particularly to those not on long-term plans is a necessity for increased uptake by younger markets (see Appendix A.2).

2.2.2 Mobile Group Communications

When land-line phones were first introduced they could only connect one person to one person. The concept of a multi-person or conference call was introduced much later and never achieved wide usage due to usability and cost issues. Businesses still make use of it, but many users complain about audio quality, lack of context and group interaction issues when using both video and audio conferencing (Bradner & Mark, 2002b). When mobile phones were first introduced they followed a similar pattern. Setting up verbal group conversations from a mobile phone is usually difficult, expensive and seldom necessary. A text-based messaging service, SMS, which was primarily introduced by mobile phone users who took a liking to features in

their phones intended for communications engineers (Ling & Yttri, 2002), has shown more promise for group communications. SMS (or simply 'texting') has grown into a wide-spread phenomenon, except in the US, where phone companies do not sufficiently support it, and Japan where mobile e-mail has served the same purpose since the introduction of mobile phones.

The use of text and visual displays permit methods of group interaction that are not feasible using audio or video. The superiority of this type of interface is reflected in the popularity of Internet-based group communication tools such as: discussion forums, instant messaging, e-mail, discussion lists and weblogs (blogs). Many people interact with communities via these mechanisms and various companies are now looking to enable access via mobile devices. However, the mobile environment is greatly different to more stable ones and the reasons for communicating often differ. Thus it is not clear whether simply porting desktop-based group communication tools to mobile devices will work and whether significant opportunities for new communication paradigms are being overlooked.

Short Message Service (SMS) permits short text based messages of up to 160 characters between phones. These messages are typically entered via a numeric keypad which has been adapted for text-based entry via methods such as multi-click or predictive text. Both result in slow text entry and usability problems (Lyons, Plaisted, & Starner, 2004). Recently many of the interfaces on these phones have been changed to support formation of groups and sending multiple SMSs to multiple parties at the same time. However, these interfaces have simply added group-oriented features to a technology that was designed for one-to-one communication, and it has resulted in an interface which poorly supports the needs of groups (Axup et al., 2005).

A technology which is just beginning to come by default on communicators and mobile phones is mobile instant messaging (IM). This ties into existing IM networks such as Yahoo, MSN and Jabber and provides synchronous chat forums between mobile and non-mobile users. This technology typically operates on GPRS based Internet connections and can produce expensive data traffic for the user. IM products work reasonably well if the phone has a qwerty keyboard, a larger screen and appropriate sound alerts.

Push-to-talk (PTT) is a recent technology which is still being explored by many markets. It allows creation of groups from contact lists, viewing the availability of

people in the group, and establishment of voice channels between them in 1-2 seconds. It has been argued that PTT offers a great service to businesses and that demand for “instant communications” is high[7]. However, most of the successful group communications tools on the Internet are asynchronous. Even IM which permits real-time conversations has developed a social protocol which results in delays in responses and slow conversations. One of the problems with voice communication tools is that they are used amidst social norms requiring rapid responses to initiated conversations. PTT exacerbates this problem by supporting multiple people expecting you to rapidly accept initiated voice conversations. It also reduces users’ ability to multi-task and attend to other environmental issues, which is a common concern of mobile users (Axup et al., 2005; Lumsden & Gammell, 2004).

Many new phones permit access to the web and Internet and third party applications can be downloaded from the Internet and installed on phones via desktop computers or wireless connections. Consequently there are a wide range of new products becoming available. Many of these leverage the social networks (see Section 2.5.5) of large groups of users to provide new products and services.

2.2.3 MoSoSo

Mobile social software (MoSoSo) is a recent extension of large-screen, commercial and academic social software that helps to connect people, visualise social networks, and communicate with each other. 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 standardise components and create an open standard for profiles[8]. This information can then be leveraged for dating or employment introductions, among other possibilities. Academic work in this area has particularly looked at tracking social ties between people, often using electronic communications as data sources (Gastavo, 2005; McArthur & Bruza, 2003).

Some of these services would like to enable their users to do the same activities while they are away from the desktop. Thus, there is some movement towards connecting mobile phones into existing social software systems and also to create

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[7] www.mobile.itmanagersjournal.com/article.pl?sid=05/04/22/1947233&tid=46

[8] www.foaf-project.org

entirely new mobile social services. For example Moblog[9] and Flickr[10] allow sharing photographs amongst contacts via a mobile phone. Dodgeball[11] supports making announcements to friends in a geographical area and being alerted to their presence. Txtmob[12] enables discussion lists that rapidly connect distributed phones into a silent and private communication forum. StreetHive[13] offers a variety of social networking features including geo-tagged comments that are visible only to your friends. These services are more than web-sites with mobile access added; they are new methods to coordinate mobile activities, new ways to connect with people *when* it is useful, and new ways for group interaction and creativity to take place.

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, Mitchell, Davies, & Smith, 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. This increases the likelihood of system designs which mesh poorly with extremely complex and nuanced normative systems in existing social settings. However, they do demonstrate prototypes of technology that is not widely used yet.

2.2.4 Navigation and Location Sensing

A variety of mobile devices now utilise GPS to provide location and navigation information to users. GPS utilizes 24 satellites owned by the US military to triangulate the location of a receiver. New PDAs are increasingly coming with GPS units and mapping software. Dedicated GPS-based navigation devices have been developed

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[9] www.moblog.co.uk

[10] www.flickr.com

[11] www.dodgeball.com

[12] www.txtmob.com

[13] www.wavemarket.com/streethive.html

for hikers, boaters, drivers, pilots and other markets. Early handheld GPS units only showed location coordinates and left some users wondering what to use them for. This contributed to the creation of geo-caching, which is a game wherein one GPS user hides an item at a location (which is typically difficult to get to). The location is then advertised and then other GPS users try to find the object. A similar idea is the Degree Confluence Project[14] which aims to photograph and post stories about every latitude and longitude integer degree intersection in the world.

Of course these devices also have more utilitarian purposes. The Garmin Rino 520[15] supports voice communication, compass, altimeter, weather information and mapping. Maps can be configured to show the location of other members of your group carrying similar units[16]. Another software application for PDAs called EarthComber[17] is producing city guides for travellers. It primarily focuses on location-based advertising, mapping applications and geo-tagging (attaching comments to locations). Luxury cars in Western countries are now starting to include computer-based navigation assistants and this has been commonplace in Japan for a number of years. I-mode based mobile phones in Japan can also supply maps, location and step-by-step walking directions in many cities.

With the advent of mobile computers that could be easily programmed, a variety of researchers became interested in contextual awareness and location sensing. It has thus become clear that GPS has difficulties in some situations. In particular, buildings and mountains can block satellite signals; in cities this phenomenon produces ‘urban valleys’ where location cannot be determined clearly, producing a variety of interaction problems for users (Flintham et al., 2002). Consequently GPS is starting to be combined with other location sensing technologies which operate effectively in urban or other obstructed areas. One of these methods is cell positioning. Mobile phones use cell towers to send transmissions. The phone company knows which cell is active for a phone at a given time and can thus determine approximate location. More accurate location data can be found by triangulating between towers. Another method which uses a similar concept is Wi-Fi triangulation. This method uses known

[14] www.confluence.org

[15] www.garmin.com

[16] www.garmin.com/products/rino520/

[17] www.earthcomber.com

locations of Wi-Fi hotspots to determine the location of a device with a Wi-Fi receiver. Most laptops and an increasing number of PDAs and communicators now have Wi-Fi networking. In research settings, other methods of determining location such as RFID tags, infrared and bluetooth have been investigated (Jones, Grandhi, Terveen, & Whittaker, 2004; Roy, Andy, Veronica, & Jonathan, 1992). These systems tend to be short range and some are costly to implement.

2.2.5 Visitor Guides

Research into developing technologies to support tourism has been popular with those exploring contextual awareness issues (Cheverst, Davies, Mitchell, & Friday, 2000; Long, Kooper, Abowd, & Atkeson, 1996), and virtual or augmented reality (VR/AR) (Benford et al., 2001). Additionally, researchers designing mobile devices and those concerned with mobile usability testing have used guides as a subject. A selection of the large number of guide studies is provided here. The section starts with work inside buildings, moves to work in small outdoor areas and concludes with applications designed for cities and large environments.

Development of mobile guides for museums has often focused on rule-based systems which respond to changes in sensor readings in comparison with a physical model of the environment. They also incorporate models of the user and how they would like the system to respond to these situations (Dubois, Gray, & Nigay, 2002). Petrelli et. al. propose a design which includes a short questionnaire for the user to complete prior to any usage of the system, so that their intentions can be modelled (Petrelli, Not, Zancanaro, Strapparava, & Stock, 2001). The authors mention a convincing scenario where the device would not be able to determine whether to change its content based on the user's location. As this demonstrates, even with accurate models, humans prove to act in unpredictable ways and environmental modelling is often impractical in less-stable environments.

A study aiming to develop an electronic guidebook for a historic house used a high-fidelity prototype paired with ethnographic observation and interviews with visitors (Woodruff, Aoki, Hurst, & Szymanski, 2001). They note that "…it is informative to observe people using the new technology in uncontrolled settings that resemble the setting in which the technology will eventually be deployed." p. 438. They also note that using informal methods allows unanticipated behaviour to be observed, unlike many formal approaches which specify objects of interest beforehand. The results of the study recommended supporting shared description of objects between

collaborative users, audio presentation of information, and visual methods of selecting objects in this museum setting. Importantly, this design avoided problems with implementing contextual awareness and let users choose information relevant to their current location.

Similarly, mixed reality research at the University of Nottingham explored connecting actual geographical locations around the campus with a virtual rendering of the same location (Benford et al., 2001). The design was intended to be used by museum visitors who wanted a different way to understand the history of a location. This product used a high-fidelity prototype which allowed the user to collect historical objects in a virtual 3D environment while they were outside, and examine them when they returned to the lab. The prototype was evaluated by participants and resulted in feedback highly specific to the technology and interface used.

One of the original guide systems was Cyberguide, developed in 1995 at the Georgia Institute of Technology (Long et al., 1996). It was intended to guide visitors at open house events held on the campus. Cyberguide provided information about the campus and positioning information to users. Two fully-functional systems were built (one indoor, one outdoor) and used during events. Surveys and some observations of visitor usage provided design feedback. There is no mention of a user requirements analysis stage and the focus of their discussion is on technical challenges encountered during development, such as tracking location and determining context.

The GUIDE system was developed at Lancaster University as an experiment in contextually aware mobile computing (Cheverst, Davies et al., 2000). The system used a tablet computer with a browser-based interface to display tourist information. An initial requirements analysis stage included interviews at a local tourist information office. A fully-functional prototype was created which supported access to context-aware information, customisable city tours, interactive services and text messaging. The research papers on the project focus heavily on technical feasibility and system architecture. User feedback on designs occurred in the form of a field evaluation by 60 tourists after the system was fully functional. Further work looked at integration of group messaging based on social networks and community authoring possibilities (Cheverst, Mitchell et al., 2000). They use scenarios describing hypothetical user interactions, but it is uncertain how real tourists want to communicate amongst each other and how the context of their environment and activity affect this.

Researchers exploring new ways to perceive urban environments developed a handheld city guide (Goel, 2002). Their design process was directed by hypothetical scenarios which addressed social networks of users and the potential of community authoring. This work included no involvement from actual users, used high-fidelity prototypes and was largely technology focused. Thus it is not clear whether this type of functionality would have real utility for users or what social issues would be relevant for the design.

Another technology-led study built a city guide for the city of Vienna called Lol@ (Pospischil et al., 2002). Users were not involved in the development project because they were “out of the scope of the project.” Much of the design was structured around hypothetical scenarios of a tourist walking in the city, finding sightseeing information and arranging tours. Cartographers were used to design the interface and a medium-fidelity prototype was reviewed by management. They also discussed plans to usability test the completed product. The device used GPS to show the user’s current location on a map surrounded by locations and information about important tourist sites. It is not clear how this would compare with more traditional tourist information products.

A study of tourist requirements for the design of a city guide was conducted by Brown and Chalmers (Brown & Chalmers, 2003). This study used a variety of methods including participant observation, video-shadowing, interviews with tourists and ethnographic observation of a tourist help centre. They concluded that “we currently have little understanding of how tourists organise their activities or of the problems they face.” p. 335. Their work explicitly noted situated reasons for behaviour, such as taking pictures for friends at home, and various tourism technologies (e.g. paper maps and guidebooks) being used in combination with each other. They recommended development of systems to allow sharing of travel experiences between travellers, and with those at home. One of the only studies looking at real usage of group communication prototypes for tourism investigated the needs of kayakers on river systems (Ranson et al., 1996). They used a variety of ethnographic and participatory methods including the evaluation of low-fidelity prototypes by paddlers while in kayaks on the river.

Goodman et. al. (Goodman, Brewster, & Gray, 2004) explored the topic of using field experiments (as differentiated from field studies) to evaluate mobile devices. They evaluated a mobile guide through tasks such as finding a post office or work colleagues. As the study’s focus was methodological, their results related to difficulty

of tracking mobile interaction and recommendations for running mobile usability tests outside the lab.

Another study involving usability testing of a guide for tram-based public transport used a combination of field and lab-based evaluation methods (Kjeldskov, Graham et al., 2004). The device supported timetable lookup, trip planning, and route determination. The study concluded that field evaluations were good at determining "ecological validity, precision of data, social comfort in use and 'system in the world' issues." (p. 60). Serious problems identified included: assumptions built into the system about what knowledge of the city users already had, and inflexible recommended paths of travel.

In summary, electronic guides have been used to support tourist activities in a wide variety of settings from museum tours to city-wide visits. Much of this research has focused on methods of having the device change its interaction with the user based on context. Many of the studies are primarily focused on the technology being used, and use high-fidelity prototypes for evaluation purposes. Recently there have been a few studies using ethnographic methods to understand existing tourism behaviour and review prototype usage in-situ. Those doing mobile usability testing have discussed the challenges of running studies in mobile settings and recommended in-situ user feedback. Clearly there is a need for a better understanding of tourism behaviour in order to form requirements, and more use of low-fidelity prototyping to explore basic guide concepts in-situ.

2.2.6 Cameras

Digital cameras are rapidly decreasing in size and cost, and increasing quality and resolution. Recently mobile phones introduced digital cameras, resulting in the new term 'cameraphone'. However, most phones now have cameras so the term is not likely to retain its descriptive value. Cameraphones enable discrete photo taking[18], amateur movie making[19] and a more personal way of documenting life. The lack of quality flash-bulbs, high-resolution and optical zooms still reduce the utility of these cameras, but these problems are rapidly disappearing.

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[18] www.usatoday.com/tech/news/2003-07-10-cell-mischief_x.htm

[19] www.textually.org/picturephoning/archives/2005/11/010488.htm

The larger and more typical style of digital camera is now reasonably inexpensive and fits in standard pockets. Tourists have long been identifiable by cameras slung around their necks and toting camera bags. The visual indicators are starting to disappear with the decreasing size and weight of the devices, but the desire to record travel experiences still remains. Backpackers almost always carry a camera and nowadays most of them are digital. There are a number of problems associated with their use, including battery life and photo storage (see Section 3.5.2.11). New technologies are helping to solve the storage problem by facilitating the transfer of large numbers of photographs from digital cameras to portable hard drives such as the XS-Drive[20]. An intriguing possibility for the future involves the direct transfer of photographs as they are taken to remote locations via wireless technologies. This would remove safety concerns, costs of portable storage and facilitate increased awareness of remote parties.

2.2.7 MP3 Players

The MP3 format is a method of compressing digital audio to a reasonably small size and with satisfactory quality. After its introduction in the Internet Underground Music Archive (IUMA), and the development of file sharing networks such as Napster, it became a widely used format[21]. With the decreasing cost and increasing size of memory cards and portable hard drives it became feasible to store music on portable electronics similar to the original Sony Walkman.

Music has a long history of providing entertainment and changing the mood of those that listen to it. The Walkman introduced the ability to add a soundtrack to life and to gain control over the audio-environment of the individual. With MP3 players with large hard drives such as the iPod, it is increasingly possible to carry large amounts of music and be very selective about what is listened to. Music players have also produced a variety of behavioural changes when used in mobile environments (Bull, 2000). This research shows young women using the devices to avoid unwanted romantic attention, people using it to lower stress levels while commuting, and to relieve boredom while at work. Pod-casting allows listening to pre-recorded audio

[20] www.xs-drive.com

[21] en.wikipedia.org/wiki/Mp3

broadcasts when a convenient situation arises. This demonstrates how the activities people do with music players are imbedded amongst the people surrounding them.

Not all backpackers carry music, but many do swear by their portable audio devices. They are frequently sitting on mass-transport, in noisy sleeping environments, stuck waiting for various activities and listening to conversations in foreign languages. iPods and MP3 players are increasingly used to help improve these situations. It is unclear how feasible it is to pick up pod-casts while on the road, but Lonely Planet is now offering travel pod-casts discussing various locations.

2.2.8 Web Logs (blogs)

New Internet based technologies are starting to change the way people travel. In particular, backpackers are starting to use web logs as a way to record their travels and update people they know about their whereabouts. The following sections first discuss what web logs are and then how they are being used by travellers.

2.2.8.1 Blogs

Web logs (or 'blogs') are primarily an electronic version of the traditional paper-based journal or diary; however, as a consequence of new tools and creative writers, blogs are evolving into something distinctly different than their predecessors. Blogs were named and gained widespread use in 1997. However, the concept of writing regularly updated micro-content for public viewing via a web page happened as early as 1992 and perhaps earlier (Serfaty, 2004, p.21). The following sections describe what blogs have been and are currently, both in a technical and a social sense. However, the medium is actively being used for new purposes and being integrated into other types of communication technologies, and thus represents a moving target.

A blog is a web site which displays regularly updated content that is often of a personal nature and produced by a single author. These web sites are sometimes hosted by a business which provides blogging services[22], or authors can set up their own blogging software on Internet servers[23]. Blog software typically has interfaces for the author to enter and manage entries and for the public to view and search them.

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[22] www.blogger.com

[23] www.sixapart.com/movabletype

Many blogs also offer facilities for reader comments, but these sections are not threaded and as a result do not strongly support community interaction. Thus, blogs are primarily structured to support consumption of blog content by readers.

Blogs also frequently provide a 'blogroll' which is a list of other blogs the author reads or recommends. Sometimes blogs reference other blogs, or have conversations *between blogs*, citing the other party's blog via links. This informal linking can produce disjointed conversations, but it also gives rise to the 'blogosphere' which is the network of interlinked blogs. Various companies now offer services to search or visualise it.[24] 'Trackback pings' are used to automatically announce new blog entries and alert other blogs that have been referenced. This can produce an element of community amongst bloggers, but it is primarily a discussion between a small number of bloggers and not the larger population of readers. Some bloggers integrate images with the text they write and increasingly other media such as video are included. Mobile blogging (or 'moblogging') is a more recent phenomena which started gaining popularity in 2002 and refers to updating blog entries from a mobile device such as a phone or PDA. In summary, blogs represent a simple publication system by which an individual or small group can regularly distribute content to the Internet with little oversight by authority figures.

Blogs are primarily a broadcast communication tool. Accordingly they can be used in any context where one person wants others to view their thoughts and have been used in many diverse situations. For example, blogs have been used to document wars ('warblogs') and daily musings on life by teenagers. Originally blogs tended to be web diaries; they were authored by one person and primarily discussed daily activities, musings and other personal items typically found in a paper diary (*We've got blog: how weblogs are changing our culture*, 2002). However, there has always been a tension between public and private diaries, and it has been argued that many diary authors secretly want a readership (Serfaty, 2004, p. 84). Blogs are usually public, and have gained media attention because of examples such as their facilitation of uncensored citizen journalism in war zones, and the publication of alarmingly personal stories. In one case it was reported that high school administrators were shocked to discover that their students were divulging intimate details of their lives in a public forum without the oversight of authority figures, and

[24] See www.technorati.com, blogsearch.google.com

had been doing so for years (Bahrampour & Aratani, 2006). Well known blogs written in this personal style cover topics such as living with health problems, trans-gender issues, various sexual lifestyle themes, religious introspection and other topics. Sociologists and literary critics indicate that personal blogs are used for a variety of reasons including a desire to document topics or situations, gain emotional support, seek recognition, advance particular agendas, or build communities (Serfaty, 2004, p. 56). More recently there have been a number of changes in blog usage and design. Some blogs now support multiple authors, which facilitates more rapid updates and broader subject matter. Smartmobs.com, for example, is a blog which documents new group communication technologies and their influence on popular culture. At the time of writing the site has 23 authors posting approximately 8 entries per day, with short commentaries and links which are read by thousands of readers. Corporations are also using blogs internally to document specific topics, and externally as a way to provide a personal face and informal appearance to the outside world (Weil, 2006).

2.2.8.2 Travel Blogs

The desire to record travel experiences is a natural impulse for many travellers. Backpackers, who are typically a younger more adventurous subset of travellers often participate in using and adapting technologies to support travel. Historically, they have described their travel experiences in handwritten paper journals, often supplemented by sketches. Digital cameras are currently the most popular method of documenting travel, but photographs are not a sufficient medium for capturing everything that travellers wish to record. Consequently there is still a strong market for paper journals and other media supporting textual accounts of travel. E-mail was rapidly adopted by backpackers to provide travel updates to those at home and keep a record of diary entries. They soon realised that e-mail also facilitated broadcasting group messages to other backpackers they had met, updating them about ongoing travel experiences, and so on. However, while e-mail supports image attachments, it does not support effective display, labelling, organisation and delivery of large numbers of photographs. Additionally, it is difficult for authors using e-mail to collect all of their writings in one location for future reference and easily send older entries to new readers. This presented a gap where user needs were unfulfilled and a new technology could enter; this technology was the travel blog.

Around 2002 it became increasingly common to meet other backpackers who were running their own blogs or using blogging services. Frequently they access these

services from Internet cafes while travelling and update pictures and text describing their travels. Some use them almost daily while others occasionally update them. Backpackers can easily send notification of blog updates to their friends, and some blogging services manage personal announce lists which do this automatically. Some blogs also have systems to permit selected users to access more private content. Other features are being added such as maps which show lines between cities depicting the path of travel. Many of these sites also offer travel planning services and seek to create online backpacker communities.

Thus, blogs are a rapidly evolving technology which is helping individuals broadcast a wide variety of content to large audiences. Travellers are one group of people who have an intrinsic need to document their activities and a desire to share this content with friends and strangers. Blogs have some similarities to diary methods, which are both a natural activity for travellers and increasingly being used in mobile device research. The primary difference between using traditional diaries versus blogs in research is that the travel bloggers are not in a research study at the time they record their travels. This may reduce an observer effect that is stronger in traditional diary studies. This research explores how backpackers' self-documentation of travel experiences can be used to better understand their needs and develop tourism technologies. The following method section covers usage of traditional and web-based diaries and corresponding analysis of their photographic and textual content.

2.2.9 Networking Technologies

A wide variety of network technologies could feasibly be applied to tourism products. HTTP and Ethernet play a significant role in enabling Internet cafes that travellers use. GPRS and EDGE are wireless protocols which enable Internet access for mobile phones. GSM and CDMA networks provide international voice calls for backpackers. These technologies are quite common and used in numerous products. Slightly less common and particularly interesting for backpackers is Bluetooth and possibly Wi-Fi.

Bluetooth is a short-range protocol with ranges of 10-30m depending on the receiver. Portable devices that both have bluetooth can be 'paired' to automatically exchange information between them. Some applications have used Bluetooth to determine the identity of other people nearby and track familiar strangers (Paulos & Goodman, 2003). The Familiar Stranger project also used static and mobile radio beacons as methods of tracking and recording devices within its range. Bluetooth can also be

used to form mobile ad-hoc networks (MANETs) which are peer-to-peer, self-routing and self-healing. It thus enables small collocated communities of users to form networks and share information without oversight by or payment to service providers.

Wi-Fi is increasingly available on mobile devices but suffers from problems related to pay-for-use offerings and configuration problems. In some countries such as the USA free Wi-Fi is commonly available and may play a role in supporting travellers. However in many countries it is difficult to find even in Internet cafes. The number of hot-spots also varies and requires the user to be within range and often near urban centres. However, it may have the potential to support positioning and certain types of activities of travellers.

2.2.10 Summary of Related Technologies

A wide variety of networking technologies and mobile electronics are currently used by travellers. Networking technologies include Bluetooth, Wi-Fi and various phone-based network protocols. Communication occurs via e-mail, instant messaging, overseas phone calls and other methods. Many different technologies are used to support travel including digital cameras, mobile phones, photo-storage devices and MP3 players. These devices form an ecological system where devices compete based on functionality, price, utility, usability and other factors. New devices introduced into this market should fit niches of unfilled needs or improve upon existing devices.

The following sections of the literature review relate to practical issues in mobile development and CSCW. These include current themes (see the next Section 2.3), common development activities (see Section 2.4), theories and frameworks (see Section 2.5), and methods (see Section 2.6). The following diagram attempts to show the relationship between these abstract and sometimes overlapping concepts (see Figure 5).

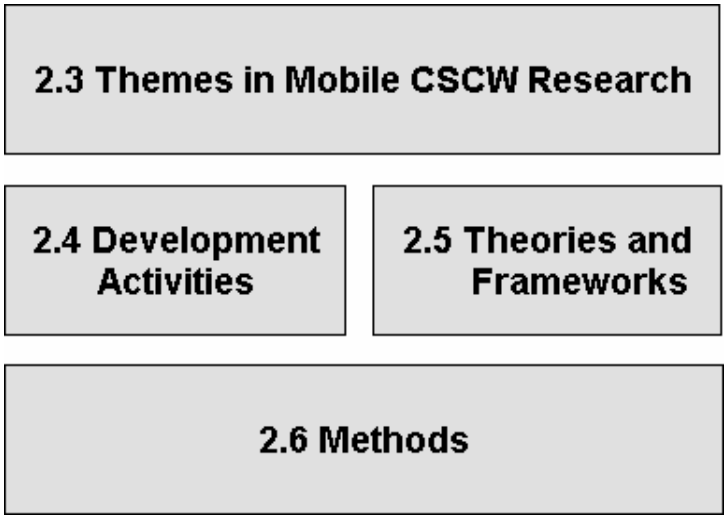


Figure 5: Diagram of the following sections. Themes arch over the other concepts. Development activities and theories and frameworks interact at the same level. Methods are influenced by the above concepts.

2.3 Themes in Mobile CSCW Research

The academic discipline of designing for mobile groups and communities is just starting to form. However, research that is available indicates a number of emerging trends that relate to how CSCW is adapting traditional methods to investigate mobility (Carroll, Howard, Vetere, Peck, & Murphy, 2002). They also relate to newly discovered mobile usage behaviours and considerations for designing mobile group devices (Taylor & Harper, 2002; Weilenmann, 2001b). This section discusses the differences between groups and communities and the fact that networks of people use individual mobile devices (Gant & Kiesler, 2002). It also addresses the issue that interfaces greatly influence behaviour and reviews problems within the discipline.

2.3.1 Groups Versus Communities

Sociologists differentiate between groups and communities. Wellman's definition of community is "networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity" (Wellman, 2001b). Groups are more general collections of people; communities have stronger bonds, histories and complex webs of social ties across large groups. In other words, all communities consist of groups, but not all groups are communities. The above definition of

community conspicuously omits geographical collocation. This is a recent phenomenon largely driven by the Internet and other communication technologies. Thus, community is no longer *necessarily* about sharing space.

The definition of a group is also debated, with some researchers requiring a minimum of three members and others a minimum of two (Shaw, 1976). The addition of the third member often dramatically changes communication patterns and the design of supporting tools. For example, mobile phones typically facilitate voice calls between two people, and adding a third party for a conference call adds significant interaction and technology problems. It is often the case that groups need to be used in studies to understand communities, and thus group studies may resemble community studies. My thesis uses the term 'group' when smaller collections of people are being referred to, and 'community' when there are broader issues of socialisation across larger numbers of people. At times group research may be cast as community research with the understanding that group issues often result in community issues.

Portions of this thesis concern both group and community interaction and design issues. If mobile devices will be mediating the communications between group and community members, there will need to be an excellent understanding of broad social behaviour and collective needs. Resnick refers to resources in social networks which are maintained by communications technologies as 'sociotechnical capital' (Resnick, 2004). It may be possible to help groups *transition to become* communities through the design of the interfaces which improve sociotechnical capital for their members. To reach this goal we need to understand how *more than the individual* is using mobile technologies.

2.3.2 Mobile Interfaces Influence Group Behaviour

Groups often have different needs to individuals. For example, they take up more space, are harder to move around, have varying levels of membership, combined goals, social mores and roles for members. Movement patterns such as swarming or flocking can develop as a consequence of intra-group communication (Johnson, S., 2001). A device designed for a single user, or a pair of users, may not satisfy the differing requirements of a group, and devices designed for a single user may be co-opted for group usage (Weilenmann & Larsson, 2002).

Traditional mobile phone ergonomics are primarily designed for supporting one-to-one and speech-based conversations. Text-entry speed for multi-tap mobile

keyboards is about 8 wpm. Experienced users of predictive text (T9) on mobiles average 20 wpm, but at the expense of visual attention (James & Reischel, 2001). Whilst other methods are being investigated, poor text-entry speeds are likely to hinder adoption of mobile e-mail, IM and text-messaging (Lyons et al., 2004). Text entry is further complicated when users are operating within rapidly changing physical environments such as when moving. "This means that they cannot devote all of their attentional resources – especially visual resources – to interacting with their device; such resources must remain with their primary task, often for safety reasons." (Lumsden & Gammell, 2004, p. 3) For similar sentiments see (Brewster, 2002). Mobile IM is now available and many phones offer the ability to form groups of contacts for broadcasting SMSs. However, we have yet to understand the use of these messaging services by mobile groups in natural settings.

Interfaces which mediate communication, such as mobile phones or IM software (see Section 2.2.2), attempt to communicate the meaning of the sender into a format conveying a similar meaning to the recipient(s). For example, person S might be depressed and wish to convey content with this meaning to person R by IM. The IM software allows text as well as emoticons (icons with facial expressions), both of which help convey the intended meaning from S to R via the interface. Anything which is perceptible by the recipient may be used to help interpret the intended meaning of the sender. In the above example, details such as if S's message is delayed by 10 seconds, or a letter is misplaced in a packet transfer, or the font of the original message is changed, may result in R determining a different social meaning. Communication devices for groups have additional responsibilities in that a group of people is trying to interpret the initial meaning and the rate of conversation can increase because of more participants.

Technology both shapes human behaviour and is shaped by how people decide to use and modify it. When individual members change their behaviour it is likely to affect the groups they are part of. For example, mobile communication technologies reduce reliance on static communication methods (e.g. land-line phones), and increase confidence and perceived safety when moving (Palen, Salzman, & Youngs, 2000). This may in turn influence how much users choose to be mobile. One study of a group of 58 university employees found that:

> *Participants, after receiving their new personal telephones, became more mobile. That is, they spent more time in locations away from home and office, and communicated in more mixed-use settings such as hallways, homes,*

> *cars, restaurants and outside. They received proportionally more communications in these places as well (Gant & Kiesler, 2002, p. 125).*

It is not just large changes in functionality such as wired versus wireless phones which impacts groups. Small changes in user interfaces may be able to affect cooperation, group awareness, trust, competition, role development and other variables (Bradner & Mark, 2002a; Bretzke & Vassileva, 2003). The structure and availability of communication channels have been shown to influence reciprocity, efficiency, accuracy and norm development within groups (Baron & Kerr, 2003). Mobile communication technologies such as SMS, IM, or e-mail may be a primary communication channel for some groups. These devices mediate relationships between members and their design may greatly influence group effectiveness and social norms which arise. All of this points to the need to better understand how mobile social networks collectively use mobile technologies and what impact these devices have on their lives.

2.3.3 Problems In Mobile Development

Many research methods are not well suited for studying either mobility or group activity (Weilenmann, 2001a). This is often due to their development prior to the emergence of mobile devices, or because they were developed for other purposes. In any case, new mobile methods are being developed which allow observation of moving users and some aspects of context which may affect their behaviour. Many of these methods, such as mobile usability testing (Brewster, 2002; Kjeldskov, Skov et al., 2004) are evaluative in nature (see Section 2.5.6), focusing on testing existing designs and primarily using quantitative measurement. Relatively few mobile studies have looked at exploratory methods involved in product conceptualisation, requirements analysis or early prototype usage (Harr, 2002; Weilenmann, 2001b).

CSCW typically uses methods well suited for stable collocated users, although some groupware systems analyse stable distributed users (Erickson & Kellogg, 2002; Leinonen, Järvelä, & Häkkinen, 2005; Weilenmann, 2001a). These methods often focus on different aspects of the environment and behaviour than are relevant for mobility studies (Carroll et al., 2002). They also primarily concentrate on *work*, which only has partial utility when designing for *fun*, which may be more appropriate in tourism research. On a related note, it has been argued that ‘work’ is now generally assumed to encompass play, domestic life, etc. and that CSCW may need to

broaden its focus to other types of group interaction (Crabtree, Rodden, & Benford, 2005; Twidale, Wang, & Hinn, 2005).

Mobile groups pose interesting challenges for these research methods. Groups can disperse, and are difficult to observe (see Sections 4.4.1 and 4.4.2). Participants can move for long periods of time. They are often immersed in rapidly changing social situations. They regularly experience different kinds of mobility with differing levels of stability, and often pause movement irregularly (see Sections 3.4.2.7 and 3.5.2.2). The methods used in this thesis work (see Chapter 3) are starting points for the generation of new exploratory methods which are more appropriate for mobile group development projects. They will undoubtedly need further adaptation to fit different physical and social circumstances, and the aims of particular studies.

A related issue is the technology-focused nature of this research, and the phase of the development process which it typically focuses on. This is clearly visible in the research on mobile guides (see Section 2.2.5) and a large portion of ubicomp research (Long et al., 1996; Pospischil et al., 2002). This results in research which seeks to explore new technologies, but does not necessarily have an appropriate or justified application for them. It also results in designs that have been developed too far before fundamental requirements problems are discovered (Carter & Mankoff, 2005).

Mobile practitioners and developers are often concerned with practical considerations such as guidelines and standards. Unfortunately (for designers) the field of mobile development is in a phase of rapid growth and diverse experimentation similar to the initial growth of the web. This is resulting in a wide range of proprietary and open standards, different screen sizes, and widely varying input and output methods. Until more is known about mobile behaviour, and technologies standardise more, guidelines will have limited applicability and utility. Guidelines for method use are given in this thesis (see Chapter 4) but detailed interface guidelines are out of scope and need to wait for stable development platforms.

A broad concern with current mobile and CSCW research is the lack of understanding of how various types of mobile groups naturally behave. Technologies should be developed to fit existing and future needs, and fill niches in existing products if it is to be successful (Norman, 1998). This thesis addresses backpackers, but there are many other kinds of mobile groups that have not been adequately studied. A few exceptions to this include a study of designing for mobile

businesspeople (Churchill et al., 2002) and a study of general tourists (Brown & Chalmers, 2003); however the latter study indicates that not enough is known about tourist behaviour. More detail on mobile group research is provided in Section 2.6.5.

In summary, there are challenges to be faced adapting traditional CSCW methods for studying mobile groups and a great deal of mobile research is overly technology focused. There is a practical need for development of new qualitative and exploratory methods, and more research concerned with understanding mobile groups to inform development activities. The next section discusses some of these activities.

2.4 Related Development Activities

There are a number of broad activities which are distinct from frameworks, theories and methods, although they may incorporate these concepts. Before the specifics are discussed it is worth considering why they will be used and what the desired outcome is. This section addresses the broad development activities of conceptualising products, developing requirements, and then communicating them with design teams to produce products. Sections after this discuss frameworks, theories and individual methods used in product development.

2.4.1 Conceptualising Products

The stage in product development where a new product idea is generated is often glossed over in research. Frequently, a product concept is invented as a consequence of wanting to explore a specific style of human-computer interaction (e.g. context aware computing) (Long et al., 1996) or a specific technology (e.g. RFID tags) (Reilly, Derek, Rodgers, Argue, Nunes, & Inkpen, 2006). In these cases the product does not originate from the people or environment in which it will be used. The conceptualisation stage is seldom mentioned in research; this is likely due to its relative intangibility and possibly a desire to avoid emphasising the artificial nature of many product origins. Similarly, many new products such as mobile phones are largely driven by the desire to implement more powerful hardware without a great deal of understanding as to how, or if it will be used. This also results in the potential of industries missing unsophisticated products such as SMS, which fit a user need but do not use new or advanced technologies.

Requirements analysis (see Section 2.4.2) that is done sufficiently early can provide initial product concepts. A researcher participating in the lives of potential users who discovers problems or desires which are not sufficiently addressed by existing technologies can easily document requirements. However, this strategy can produce difficulties for researchers who want to study a specific type of technology, instead of how to support a specific person or community with whatever technologies they could use.

An excellent example of this type of product conceptualisation comes from Charles Leinbach who spent time with owners of caravans (motor homes) travelling in the US. His team observed and talked with travellers for six months, with the intent of finding opportunities for new products (Leinbach, 2002). They were employed by a caravan manufacturer who was interested in the design of caravans and the broad class of accessories associated with them. Many of their proposed products were surprising: such as the recommendation for *smaller* petrol (gas) tanks, which got better mileage and were effective because petrol stations were not far apart. Interestingly, their research produced a range of product ideas within the scope of mobile travel technologies, but these ideas did not have any bias towards new, advanced or intrinsically interesting technologies. Instead, their origin was from the environment where they would be used and they addressed existing needs of the target users.

Traditional ethnographic methods (see Section 2.5.2) were designed to describe cultures, not to focus on problems or envision design solutions. More specifically, approaches such as ethnomethodology actively resist external perspectives on behaviour and seek to convey the socially-constructed perceptions of participants (Dourish, 2001). This consequently hinders documenting something as a problem which potential users did not see as a problem to begin with. There has recently been a movement towards placing designers in the field who use ethnographically-inspired methods with potential users (Squires & Byrne, 2002; Viller & Sommerville, 2000). In this approach, researchers specifically focus on aspects of behaviour and the environment which are relevant for design. A design-based observational filter such as this necessarily produced biased accounts; however it also tends to produce user requirements which are more useful to the design process than is typically provided by ethnographers (Anderson, 1994).

2.4.2 Requirements Engineering

Requirements engineering (RE) is the process of determining what a system needs to do, documenting these traits and then validating that the product meets them (Pohl, 1993). This process usually involves development of a specification of different types of requirements, but more importantly it implies an iterative process of determining them. It has been argued that requirements specify the problem that is to be solved, and that design specifies how to solve it (Jackson, 1995; Macaulay, 1996). However, it is now thought that requirements and designs are interrelated and co-evolve as each allows more insight into the other (Kotonya & Sommerville, 1998). Experts in the field advise that there is no single appropriate process that can be followed, that requirements are never complete and that the process is more important than the specification (Sommerville & Sawyer, 1997).

A RE process covers a wide range of technical and social issues which relate to necessary functionality in the system. A typical requirements specification document includes (Kotonya & Sommerville, 1998):

- services and functions which the system should provide,
- constraints under which the system must operate,
- overall properties of the system,
- definitions of other systems which the system must integrate with,
- information about the application domain of the system, and
- constraints on the process used to develop the system.

People are a component of any socio-technical system and thus affect the success of most software projects. Traditionally RE specifications focused greatly on technical issues and used idealised user roles and use cases depicting logical user behaviour. With the advent of CSCW and groupware systems it became clearer that this form of understanding of user requirements is not sufficient. In some cases user requirements are perceived to be synonymous with user interface requirements (Kotonya & Sommerville, 1998), but it is clear that there are a great deal of social issues which affect requirements and eventual use of a system (Grudin, 1994; Rouncefield, Viller, Hughes, & Rodden, 1995). Actual social behaviour is seldom predictable and frequently does not adhere to documented work processes.

In a trend similar to most modern software development, RE now advocates requirements processes that are user-centred, iterative and spend significant time early in the process to understand design issues more thoroughly. In order to understand user and environmental requirements better, RE has started to use methods such as participant observation, field studies and interactive use of scenarios with end users. Prototyping, which is a method commonly used in early design (see Section 2.6.4) is also advocated as a requirements analysis tool (Macaulay, 1996, pp. 121-124; Sommerville & Sawyer, 1997, p. 94). Macaulay indicates a wide variety of applicable methods for understanding requirements, which originate from fields as disparate as marketing, participatory design and formal software engineering (Macaulay, 1996). Thus, any observation about the existing environment of future users or their needs can be described as part of a requirements process.

2.4.3 Communicating Requirements Within Design Teams

For at least the last nineteen years it has been generally recognised in the CSCW community that there needs to be increased focus on the social situations in which technology is used (Hughes, J. A., Randall, & Shapiro, 1993; Suchman, 1987). Grudin has described focus on the work setting as the most recent stage of HCI. Similarly, the lack of attention to actual usage environments is thought to be one of the key factors leading to the lack of success of CSCW products (Grudin, 1990; Heath, C. C., Jirotka, Luff, & Hindmarsh, 1995). Ethnography, ethnomethodology, field studies and other in-situ theories and methods are typically what is recommended to rectify this situation. However, there is considerable debate over how to integrate sociology and related disciplines into existing software engineering practices and design teams (Button & Dourish, 1996). There is also considerable debate over the difference between ethnography, ethnomethodology, sociology, field studies and field experiments (Button & Dourish, 1996; Goodman et al., 2004). For the purposes of this thesis I will simply refer to the people who observe natural environments and make those observations available to a design team as ethnographers.

Several strategies for integrating ethnography into design processes have been proposed (Button & Dourish, 1996; Viller & Sommerville, 1999b).

1. The ethnographer directly (e.g. a meeting) conveys findings to the designers.
2. The ethnographer indirectly (e.g. a written report) conveys findings to the designers.
3. The design process is restructured to directly implement the ideals of ethnography.
4. Design team members do ethnographic work and use it directly in designs.

In practice, the lengthy and detailed notes of ethnographers are not typically condensed enough to fit the needs of rapid development (Hughes, J. A. et al., 1993; Millen, 2000b). However, there is a strong desire by design teams to understand these insights about actual usage. With distributed and large development teams becoming increasingly common, there is also a need to support indirect communication of these findings when staff trained in ethnography are not available in person, or at all. This has resulted in the development of a number of different methods of depicting ethnographic accounts in a more structured and condensed manner.

Methods designed to help convey ethnographic information more effectively include design patterns (Martin, Rouncefield, Rodden, Sommerville, & Viller, 2001), frameworks for understanding work settings (Hughes, J. A., O'Brien, Rodden, & Rouncefield, 1997), vignettes (Button, 1993), scenarios (Richard & Phil, 1987), picture scenarios (Pedell, 2004), UML diagrams (Viller & Sommerville, 2000) and other methods. Each takes a different stance on how to determine patterns or key findings, and abstract them away from less significant details to streamline communication. However, none of these methods is designed specifically to address mobility. Some of the CSCW-based methods support groups, but none of them specifically address mobile groups. This raises the question of how ethnographers studying mobile groups will be able to document their findings in a manner suitable for design teams. In response to this, this thesis research has developed a number of diagramming techniques to assist communication of the behaviour, situations and needs of mobile groups (see Section 3.8.2).

2.4.4 Summary of Related Development Activities

This section has reviewed a number of activities conducted by development teams. These include conceptualising products, understanding and documenting requirements, and communicating understandings from the field into workable designs. These activities are a necessary part of modern product development processes. However, there are issues with supporting these activities using existing methods which are not well suited either to mobility or group interaction.

2.5 Related Theories and Frameworks

There are a number of design perspectives (or philosophies) which often influence which existing methods are selected and used, as well as how new methods are constructed. These perspectives are typically described as theories or frameworks. In a practical sense this means that they are not actual physical procedures for conducting or designing a study, but instead provide higher-level guidance about how to use methods or the broader intent of doing design in a certain way. Sometimes theories merge with methods to a degree, but it is usually possible to discern higher level issues. It becomes more difficult to determine which theories and frameworks supersede other theories and frameworks, and only a partial attempt is made to discern this here.

This section begins with user centred design (UCD) which is one of the more general and high level theories in HCI. This is followed by the framework of ethnography and participatory design (PD) theory. After this is the action research (AR) framework, and social network theory. Then the broad concepts of formative and summative methods are discussed, followed by the concept of context and what it means for mobile device design. The section concludes with an overview of a category of relevant methods called self-reporting methodologies. This provides a foundation for the following section on methods (see Section 2.6).

2.5.1 User Centred Design

User centred design (UCD) is a people-oriented perspective on technology development with origins during the 1980s (Norman & Draper, 1986) as well as a diverse set of methods that embody these ideals. UCD arose in reaction to the established software engineering and systems analysis methods of the time, with

their predominantly technical focus on the development process. It was also affected by the growth of Human Factors during WWII (Meister, 1999), an interest in applying cognitive science to technology development, and the rise of participatory design in Scandinavia (Floyd, Mehl, Resin, Schmidt, & Wolf, 1989).

Being user centred implies a different sense of values in software development, a different process, and different development goals from those traditionally used. UCD places users first, investigating their demographics, behaviour, context of use, social norms and other factors (Rubin, 1994). It seeks to mould technology to fit the constraints of people. It also moves away from the linear 'waterfall' model of system development and towards a cyclical model allowing continuous revision and reversal if need be (Bannon et al., 1993; Dix & Beale, 1996). UCD development cycles allow for multiple variations to be designed and tested until satisfactory, before moving to later development stages. This allows the success of the technology to be judged on more than its theoretical ability to perform a task effectively; it is judged based on its actual ability to perform the task, by its intended users, in their normal environment (Rubin, 1994; Wixon & Wilson, 1997).

UCD typically places more emphasis on the following: fieldwork and conceptualisation phases, a detailed understanding of users, involvement of users in development, extensive use of prototyping methods and utilisation of cyclical design processes (Dix, 2003). Early research and prototyping phases are extended in UCD. This is because it is cheaper and faster to make changes earlier, before detailed development has started and technologies are chosen making designs inflexible (Carter & Mankoff, 2005; Houde & Hill, 1997). Observation of users provides a rich understanding of their needs and characteristics of real interactions. Seeing how people use prototypes or similar technologies can permit a high degree of design refinement in early development stages (Snyder, 2003).The central premise of UCD is that it involves real users in the development process; and this is still not satisfactorily accomplished in many modern software development projects.

Involving users in product development is a very broad concept and consequently a wide variety of other philosophies and methods are used within it. For example, formal task and user modelling methods which often do not see a great deal of user input or observation are often advocated in UCD processes. On the other side of the coin, participatory design advocates a more extreme style of user involvement where designs have political intent and users co-create interfaces with designers.

Consequently there still remains a great deal of debate around which methods should be used and how users can best be involved in the design of new products.

2.5.2 Ethnography

An ‘ethnography’ is a rich description of people interacting in an environment (Lofland & Lofland, 1995). Ethnography itself is a theoretical framework concerning how to understand and document cultures which advocates observation and participation with those being studied in the field. Ethnographic methods vary, but often include interviewing, direct observation, participation in activities and lengthy detailed descriptions of the environment being studied.

Ethnographies were traditionally written by anthropologists who studied groups as diverse as remote villagers, urban gangs and pagan religious groups (Lofland & Lofland, 1995). Descriptions of these complex cultures often took months or years to complete. Doing this type of longitudinal research can be costly, both in terms of time, money, and effort. However, it is often necessary to spend significant amounts of time when trying to understand larger patterns of behaviour, and learn insiders’ information which is not openly discussed without a trusted relationship between researchers and participants.

During the early 1990s there was a growing dissatisfaction with requirements analysis in software engineering which led some western researchers to look towards ethnography as a solution (Luff, Heath, & Greatbatch, 1992). Researchers in Scandinavia had a long tradition of field work, but in different settings and with different motivations (see Section 2.5.3). Western researchers looked for ways to adapt the verbose ethnographies of workplaces into formats that were usable for forming requirements or generating design concepts. During this time the concept of a ‘quick and dirty ethnography’ came about, which advocated ethnographic studies of much shorter duration with potential users of software systems (Hughes, J., King, Rodden, & Andersen, 1994). Rapid ethnography is increasingly being used in requirements engineering processes (see Section 2.4.2) (Anderson, 1994).

Some researchers argued that increased fieldwork and understanding of the work domain was needed, but that traditional ethnography was not what was required (Anderson, 1994). This argument was largely semantic; it argued against relaxing the definition of the term ethnography to apply to shorter studies, indirect observation and less realistic environments. Instead it was proposed that the term ‘field study’

should be used to describe them. While the intention behind this may have been good, it does not seem to have worked. Stricter researchers still refer to their research as 'ethnographically-inspired', but many researchers simply refer to them as ethnographic research (Berg, Taylor, & Harper, 2003; Blythe & Monk, 2002; Hutchinson et al., 2003; Ito, Mizuko & Okabe, 2005; Millen, 2000b; Taylor & Harper, 2001). Thus the term has now broadened to include more traditional long-duration studies, shorter field studies, partially naturalistic studies, and in-situ self-report studies.

Ethnography typically has minimal impact on an environment under study and often focuses on how people naturally operate within it. However, short term fieldwork can sometimes be used to rapidly gain an understanding of similar information (Millen, 2000b). Ethnographically-inspired field studies (hereafter called ethnographic studies) can introduce new variables into a situation, such as a prototype device or an artificial activity for users to do (for an example see Section 3.5.1). This reduces how natural observed behaviour is. However, it is critical to note that *all observation methods* change the environment being studied, and small changes can allow insights into future natural behaviour. With the advent of mobile device research and corresponding requirements analysis and usability studies, there has recently been a great deal of innovation in the area of in-situ methods (Hagen, Robertson, Kan, & Sadler, 2005). Many of these methods derive from traditional ethnography and have similar aims to understand situated socio-technical systems. One variant of traditional participant observation is called team ethnography (Lofland & Lofland, 1995). This uses several observers working in unison to observe group (and often mobile) behaviour (Axup et al., 2005; Lofland & Lofland, 1995; Weilenmann, 2001a).

The primary point in calling something 'ethnographic' now seems to be that it is done in a reasonably natural environment, observing (directly or indirectly) semi-natural behaviour, with minimal intervention, for an appropriate duration given the purpose and constraints of the study. In-situ methods are discussed below (see Section 2.5.7), as well as team ethnography which has been used in this thesis research (see Section 3.5).

2.5.3 Participatory Design

Participatory design (PD) comes from Scandinavian software development traditions which originated as a product of the local culture during the 1950s. Denmark, Norway and Sweden have long traditions of social democracy, egalitarianism and

cooperation for the common good (Floyd et al., 1989). Unions formed during the industrial revolution to protect worker rights. Early PD was a political move to legally require worker participation in determining changes in the workplace (Helander, Landauer, & Prabhu, 1997, p. 303). Consequently, early Scandinavian software development began in a context where workers had the legal authority and interest to co-determine their own future workplaces and processes (Greenbaum & Kyng, 1991, p.11). Strong ties developed between business, researchers and unions to cooperate in the design of new computer systems. In this environment PD formed as the de-facto ideological theory guiding the software design process.

Much of the theoretical foundation for PD lies in the desire to avoid what were considered the de-humanising effects of the industrial revolution and capitalism in general. Consequently the methods used have a political intent to avoid deskilling of workers and form democratic workplaces and technology development. There are also parallels between PD theory and Luddite perspectives on technology development. During the Industrial Revolution in England, a group of factory workers came to be known as Luddites after they destroyed automation machinery which they believed would replace them (Darvall, 1969). Neo-luddites are sceptical of the benefits of modern technologies and often advocate a return to a more ‘natural’ existence which values human quality of life and uses simpler forms of technology (London, 1997). Similarly PD seeks to manage technological introduction in the workplace and maintain quality of life for workers who will be affected by it. See Section 6.7 for a more detailed discussion of the Luddites and what can be learned from them about the politics of modern design processes.

PD emphasises that the development process greatly influences products being designed. It focuses on the social aspects of organisations and aims to support cooperative work processes. Designers play a less privileged role since they share control of the resulting design with potential users. Specific goals of PD include participation of stakeholders with different areas of expertise, prototyping of ideas and codetermination of technologies and work practices.

PD theory can be applied both to product development processes and methods. In both cases it has distinct differences from traditional western software development. western software engineering commonly uses: fixed requirements, temporal phases, requirements documents, methods which dictate work practice, validating correctness, formal language and distribution of programming tasks (Floyd et al., 1989). This contrasts with the Scandinavian perspective which is cyclical, informal,

holistic, cooperative and evolutionary. During its development PD specifically focussed on providing an alternative to rational methods used in the west. PD theorists viewed task, user and environmental modelling as reductionist methods of portraying users and work which did not contribute to development of humane technologies (Helander et al., 1997). PD practice, and the development environment which it is used within, has changed over the course of 50 years. A short selection of well known PD research is provided below to give a flavour for how the research is structured and its origins.

Now thought to be a subset of user centred design (UCD) (see Section 2.5.1), PD generally advocates increased involvement of project stakeholders (particularly users) in all stages of product development. Modern PD typically engages users that will be affected by a technology under development, and uses extensive iterative prototyping with them. In this way the potential future use of a technology can be envisioned in the environment where it will be introduced and used. Development usually proceeds in a fashion overseen and supported by the intended users.

The UTOPIA project is a good example of this. It involved typographers and journalists in the design of a new system of technologies to support newspaper production (Ehn & Kyng, 1991). It made extensive use of cardboard and paper mock-ups of various future technologies such as high-resolution screens and laser printers. Language games and hands-on interaction with designs were used to help create a system where journalists and typographers could peacefully co-exist while improving product quality. Similar research has used mock-ups with different degrees of fidelity to support design discussions and development of industrial products for the food industry (for more about prototypes see Section 2.6.4) (Brandt, 2005b).

A variety of recent research utilises a participatory approach. One study utilised workshops with high-school students to help design a museums exhibition. Another project looked at helping community groups design and maintain technologies to support their activities (Merkel et al., 2004). Some of the disadvantages of using PD are addressed in a paper describing research with a social service agency (Luke et al., 2004).

Given the focus on understanding social systems in the workplace, it is not surprising that ethnographic and in-situ techniques are commonly used. Video taken in the workplace is commonly used to help inform design (Buur & Soendergaard, 2000; Suchman & Trigg, 1991). It is also common to do field visits or develop product

designs in the workplace. Workshops or focus groups, which are often held on-site, are also frequently used as a method to co-develop designs. These often utilise low-fidelity prototyping materials or design games (Brandt & Messeter, 2004).

There is also a different variation of PD which refers to end-user programming or customisation. Several papers have addressed whether end-users should be given the ability to program or modify existing software programs for specific purposes (Gammack, 2002; Wagner, 2002). From this perspective, users of programs such as Excel have the ability to design portions of the software's functionality themselves, through methods such as scripting. The research results are mixed. Some indicate that end users do not have the training to program and that programs offering modification facilities are too complex and have poor usability (Wagner, 2002). Others indicate that it enables end-users to do operations that were not designed for them and supports expert users (Gammack, 2002).

PD theory and methods are now being used in different cultural, temporal and physical contexts from their origins. Many modern development environments do not have unions, are not in industrial settings and involve political agendas to a lesser degree. Fortunately UCD, which is an established industry development framework, also highly values user participation in development processes. Thus there is currently a process of reviewing PD theory and methods to determine what is appropriate for modern development projects (Shapiro, 1994). Novel methods of designing with users, ways of understanding future work processes, and iterative prototyping are participatory techniques likely to be integrated into mainstream UCD.

2.5.4 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. AR advocates a cyclical process of problem *diagnosis*, action *intervention*, and reflective *learning* (Avison, Lau, Myers, & Nielsen, 1999). 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). The framework has been used in management science where it primarily focuses on applying these techniques to manage and improve

organisational systems (Argyris & Schon, 1978). AR frequently aims to recruit those being studied as active researchers, who become part of a research network with connections to external researchers who provide resources and advice. When AR is paired with qualitative and observational techniques, it is called ethnographic action research (EAR), which is often used in developing nations. There is also a related area called network action research (NAR) which emphasises the structure of 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 affected 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 et al., 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 et al., 1989). PD is also a design theory, but it is strongly correlated with certain types of methods which encourage direct interaction with future users. While PD does acknowledge the influence 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 probably 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 (Iacucci, Kuutti, & Ranta, 2000).

2.5.5 Social Network Theory

Social Network Theory uses methods of depicting and analysing networks of people to help understand and communicate the ways in which they are connected (Wasserman & Faust, 1994). It draws on graph theory and sociology to understand group or community behaviour and make social connections tangible. Graph theory in sociology originally arose as a response to anthropological accounts of cultures which could not be analysed in a quantitative fashion, or to depict intangible aspects of observations. Early use of graphs in sociology was developed by Jacob Moreno who used them to show structures of communities and groups. Doing research related to community ties, his graphs showed which babies recognised each other, which members of a community liked or disliked each other, and friendship choices (Morena, 1934). These graphs are called ‘sociograms’ and the related concepts of tie direction, use of colour, arrangement, and coded nodes and ties helped to expand their utility.

A well known example of early social network usage was a graph of women in a community attending social clubs and events (Davis, Gardner, & Gardner, 1941). These types of graphs allowed visualisation of ‘bridging ties’, or people who knew people from other groups and who had more influence and information in the communities they lived in. These people are said to have more ‘social capital’, which is physical and informational resources which individuals can draw from their social networks (Lin, Cook, & Burt, 2001). Another well known example is the research of Milgram in the 1950s who discovered that social networks of Americans were surprisingly interlinked, making passage of a letter between two randomly chosen people a much shorter path than expected (Barabási, 2002, p. 27-30). It has

subsequently been discovered that many other relationship graphs in biology, economics and sociology are examples of these ‘small world’ networks. More recently a popular question has been how new technologies such as the Internet are affecting our communities and whether we are collectively losing social capital (Putnam, 2000). This question is still being explored, but sociologists studying a wired suburb in Canada reported higher social capital for those members of the community with Internet access who used it to communicate with others both inside and outside the neighbourhood (Hampton, 2001). Thus, social network diagrams have both shown an ability to depict and help analysis of intangible aspects of social relations, and to analyse how new technologies may affect our societies.

Early social network graphs were drawn by hand and were difficult to manipulate. However, recent software support for social network visualisation (e.g. Netdraw, Pajek) has made analysis more rapid and increased visualisation quality (Freeman, 2000). In the area of Computer Supported Cooperative Work (CSCW), social network research has often used e-mail or other contact listings to map relationships between people (Hampton, 2001; Tyler, Wilkinson, & Huberman, 2003). Industry has recently merged social network theory with the web to produce social software, and with mobile phones to produce mobile social software (MoSoSo) (see Section 2.2.3). Social network researchers indicate that these dynamic social networks are not yet well understood, and modelling moving or dynamic networks remains a challenge (Gloor, Laubacher, Zhao, & Dynes, 2004).

Backpackers form these dynamic social networks as they travel and exchange information which can affect their resulting travel (Huxley, 2005). Similarly, Riley indicates that “communication networks are a salient feature of budget travel” (Riley, 1988, p. 322). Accordingly there is an opportunity to apply social network analysis to requirements engineering for mobile groups, and specifically backpackers, which would assist in the development of new mobile CSCW and tourism technologies.

2.5.6 Formative, Summative, Exploring and Evaluating

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

'Formative' and 'summative' are common terms used to differentiate between types of evaluation (and inherently the methods used to evaluate). These terms come from educational contexts where testing of students occurred iteratively throughout a process (formative) or at the end of instruction (summative). However, when the terms were introduced into the HCI community they came to take on other connotations. Formative evaluation took on the connotation of guiding change and design from within the process (Helander et al., 1997; Preece, 1994). Summative evaluation came to emphasise testing how good a product was, which occurred after a product was completed (Preece, Sharp, & Rogers, 2002). So in this sense, a research method such as formal usability testing could be applied at any time during the software development lifecycle and be formative evaluation. A summative method might be an accessibility evaluation of a completed web site to determine conformance to established guidelines.

However this conceptualisation seems to miss the changing fidelity of design, from basic conceptualisation and pencil sketches to functional prototypes with interactivity, which need different methods and aims for using them. Another common distinction is between 'research' and 'design' methods. Research methods are typically described to happen earlier and focus on requirements or user analysis. Design methods happen after this and represent the building stage, prior to or concurrently with full development activities (Mayhew, 1999; Preece et al., 2002, p. 182-195). However, many methods such as scenarios, technology probes, and Wizard of Oz prototyping (Binder, 1999; Dahlbäck, Jönsson, & Ahrenberg, 1993; Hutchinson et al., 2003) seek to understand how technologies could be generated to integrate with existing settings. These methods are at the boundary between research and design. They incorporate elements of evaluation, research and design concurrently in an effort to get user feedback about the potential future. These methods are used during the critical stage of initially determining product concepts, which greatly affect the structure of the resulting product. It is also very unclear exactly what ‘design’ encompasses, and how design research fits into this dichotomy. Consequently it may be best to visualise the relationships between these methods in a different way.

It is widely acknowledged that methods and corresponding goals change based on the stage of development in which they are used (Mayhew, 1999). This development model is often depicted by a spiral representation showing increasing design fidelity (Boehm, 1988) and its cyclical nature is often noted. Despite its spiral and cyclical nature, we have depicted our diagram as a straight line to make it easier to

understand (see Figure 6). It is usually advised that methods used earlier should be less structured, flexible, qualitative, and explorative (Rubin, 1994, p. 30-46). Some definitions of formative evaluation are in agreement with this; they emphasise the need to generate new design concepts, select promising ideas and rapidly investigate concepts. This contrasts with methods used later which emphasise evaluating existing design concepts, testing if ideas are good, and being more structured.

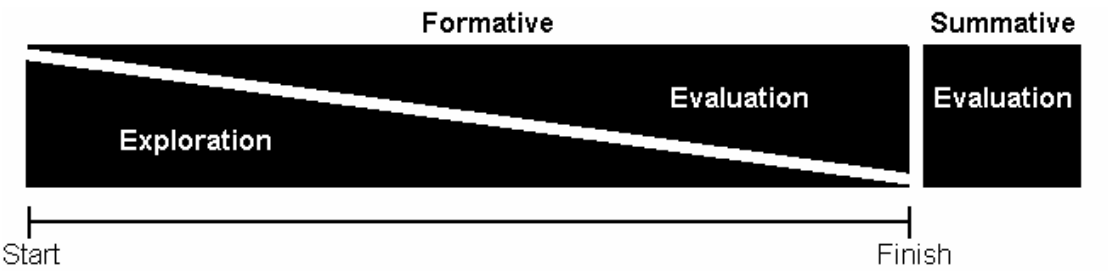


Figure 6: Exploration and evaluation happen to different degrees during use of formative methods.

Methods used early tend to be more 'explorative'. As Rubin explains “The main objective of the exploratory test is to evaluate (although evaluate is too judgmental a term at this stage, examine or explore is a more accurate term) the effectiveness of preliminary design concepts...” (Rubin, 1994, p. 31). These methods are used during activities such as requirements analysis, product conceptualisation (ideation), and early prototype creation. Methods used later are more 'evaluative' in that they review existing concepts instead of originating them. They involve activities such as formal usability testing, expert review and guidelines reviews. This brings to light some of the confusion in calling something a formative or summative ‘evaluation’. When products are first being conceptualised the evaluation happens in a less structured fashion and possibly not at all. As a result, it appears that formative methods have two different aspects (on a continuum), consisting of 1) exploratory and 2) evaluative.

The research presented in this thesis is largely exploratory and only slightly verges into the territory of evaluating designs. My aim is ideologically similar to that of Charles Leinbach who spent time with owners of caravans in the US looking for opportunities for new products (Leinbach, 2002) (see Section 2.4.1 for more detail). I argue that an increased focus on exploratory methods in mobile group research is needed, and would be of high use to those developing products in this area.

2.5.7 Context

Context, as used within the design field, is generally agreed to be aspects of a person's situation which influence usage of a device. Dey et. al. indicate that it is "any information that can be used to characterize the situation of entities (i.e., whether a person, place, or object) that are considered relevant to the interaction between a user and an application, including the user and the application themselves. Context is typically the location, identity, and state of people, groups, and computational and physical objects." (Dey, Abowd, & Salber, 2001, p. 106)

There are two primary reasons why designers are interested in context: 1) because it affects how people use technology and the corresponding validity of research methods, and 2) because it is becoming possible for computers to automate interactions with users based on certain types of contextual information. The research in this thesis primarily relates to the first issue. However, it touches slightly on the second issue because some of the designs which backpackers collaborated on contained features which utilise context. The beginning of this section discusses theoretical conceptualisations of context and why ubiquitous computing (ubicomp) has played a significant role in this. A discussion of in-situ methods which rely on accurate context to ensure ecological validity follows this. The section concludes by covering how context is relevant for mobility.

2.5.7.1 Theoretical Conceptualisations of Context

The significance of context for design and human behaviour has been the subject of lively debate, at least since the publication of Suchman's Plans and Situated Actions and perhaps before (Suchman, 1987). Most formal definitions of context (Bauer, Martin, Becker, & Rothermel, 2002; Chalmers, 2004; Petrelli et al., 2001) have originated from work on ubicomp systems which aim to understand and often to respond to context to make human-computer interactions more transparent (Weiser, 1991). Early definitions tended to be focused on describing external aspects of the environment that influenced behaviour. The concept of context is so abstract and all-encompassing that a variety of philosophers' theories are regularly used to justify approaches for using context in design. Garfinkel, Wittgenstein, Merleau-Ponty, Schutz , Strauss, and Descartes are but a few of the regularly cited sources (Dourish, 2001, 2004). Theory and philosophy play an important role for science, in that they allow thinking outside of the realm of what is currently scientifically verifiable and can guide empirical research. However, there is also the potential for them to become an

end unto themselves with little substantial impact on design practice. It is of course subjective as to what is useful theory and what is not. To avoid problems, method development and application of theory can go hand in hand, with a critical eye to ensuring they do not fall out of balance with each other. It is useful to bear this in mind when reviewing the field of context research.

A particular division in the context research community is around physical/positivist or social/phenomenological views of context (Chalmers, 2004). The first focuses on logical representation and planning, and the second focuses on social construction and subjectivity. The positivistic approach to context faces a large challenge because most definitions of context are extremely broad and high-level (Tamminen, Oulasvirta, Toiskallio, & Kankainen, 2004, p. 135). Generating a *comprehensive* description of any given context is impractical partially because of the large scale of the problem. Additionally, describing the state of people in a public location, or the meaning of their behaviour, let alone their internal psychological state is not only currently scientifically impossible, but probably encompasses a number of unquantifiable elements. However, there are common contextual elements such as location, identity and time which are available across all usage situations and can be more easily summarised. Given the fact that any practical description of these contextual issues will necessarily be a subset of the total (and unattainable) context, the question arises as to how complete, or predictive, or useful this abstracted description is. However, there have been a variety of research projects which explore this area and attempt to develop frameworks and models of context, as described below.

For example, Dey et. al. developed the Context Toolkit which utilised a conceptual framework for context to allow programmers to use widgets, interpreters, aggregators, services, and discoverers in their applications (Dey et al., 2001). Winograd differentiates between frameworks for context and those for context awareness, and views context as applying only to communication (Winograd, 2001). He proposes architectures for context that are dramatically different than how humans use or understand context. Similarly, other researchers have developed models and scripting languages for describing physical environments in both centralised and ad-hoc settings (Bauer, Martin et al., 2002). Also see Section 2.2.5 for guide designs which use similar approaches to contextual-awareness.

It has been argued that examining the context of design situations on a case-by-case basis, generally results in more useful requirements for system development and

guidance for human-computer interaction (Oulasvirta, Kurvinen, & Kankainen, 2003). This approach implies an underlying agreement with a social-constructionist (Burr, 2003) perspective on context. In this view, context is a continuously evolving situation determined by the ongoing actions of people, and the changing environment they operate within (Greenberg, 2001). This makes prediction difficult or impossible, and acknowledges the complexity of how humans generate meaning from their environments and respond to it and other people. This argument has also been used to claim the futility of designing systems that automatically respond to certain contexts and justify reducing expectations for these systems (Brown & Randell, 2004).

Use of ethnographic methods can help understand people's interaction with their environments and typically results in rich descriptions and personal experiences of the situations where devices will be used (Brown & Chalmers, 2003). These methods can also help to identify the most significant aspects of a situation (as defined both by users and designers) so that any models that are developed focus on what makes a difference in the situation. Ethnography is also focused on identifying patterns in actual behaviour, which can be used to understand typical responses to common situations (Anderson, 1994; Martin et al., 2001). Exploring context with in-situ methods such as this allows subtle interactions to become apparent and avoids the possible misconceptions of top-down theoretical models of user-environment interactions.

2.5.7.2 In-situ Methods

Many of the failures of modern software development processes have been linked to poor understanding of requirements, customer characteristics, usage environments, real usage behaviour and other issues related to context of use (Gammack, 2002; Kotonya & Sommerville, 1998; Kujala, Kauppinen, & Rekola, 2001; Sommerville & Sawyer, 1997). It has been demonstrated that actual usage of technologies in environments as common as small offices is very complex and greatly affected by social issues (Rouncefield et al., 1995). Such settings are full of details which could prove problematic for software implementations if not understood from the outset of design or examined while designing. Early work in participatory design encouraged in-context hardware and software development (Floyd et al., 1989), and this tradition carries on in modern participatory research (Brandt, 2005a; Sperschneider & Bagger, 2003).

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

2.5.7.3 Context of Mobile People

The advent of mobile computing has resulted in new perspectives on context, and enhanced concerns that understanding how context influences mobile behaviour may be a critical part of design (Luff & Heath, 1998). Ubiquitous computing (ubicomp) is also a related area interested in utilising context. Ubicomp is interested in miniaturising and embedding technologies, and designing transparent interfaces which typically use uncommon interaction paradigms (e.g. gesture, voice) and often automatically perform tasks for the user (Weiser, 1991). Many ubicomp projects have looked at formal models of context, sensor arrays to collect contextual information (e.g. movement), and methods of automatically responding to this information (Cheverst, Mitchell, & Davies, 2002; Geldof & Terken, 2001; Goßmann & Specht, 2002; Michahelles & Samulowitz, 2002). Many of these systems are designed to work in low-mobility settings and often rely on embedded tracking technologies which are only available in limited settings (Bauer, M., Heiber, Kortuem, & Segall, 1998; Eagle & Pentland, 2005). However, newer ubicomp work is moving out of labs and into more traditional settings. Consequently it is now sometimes difficult to distinguish between mobile HCI research, ubicomp research, wearable computing research and other areas. All of these disciplines are interested in usage environments, automation, personalisation, agents and other design issues which relate to context.

The context of mobile users is particularly challenging to understand or utilise in design because it is so dynamic. Research methods are still struggling to effectively

observe it and designers of various types of mobile systems are struggling to determine how it impacts upon their designs. Mobile devices are increasingly being used to facilitate interactions with groups and social networks while the user moves, and this has placed increased emphasis on the social context of mobile users (Brown & Randell, 2004; Ljungstrand, 2001).

Some researchers have begun to extend the context debate into the mobile sector, labelling this 'mobile context' (Tamminen et al., 2004). Mobile context is an odd term because it is unclear what is *not* mobile context when most people regularly move to some degree. It is also unclear in this definition as to whether the person or their environment (e.g. a bus or train) is moving and how context-aggregations (between multiple situations) can be conceptualised. Accordingly, it may be more productive to look at the degree of change in the environment on a spectrum from static to highly dynamic, and encourage multiple context descriptions. Social-constructivist models of context already account for mobility (it is just a more dynamic form of construction); however, they do not necessarily provide useful tools with which to inform mobile designs. The Locales Framework, which is based on social-constructivist theory, can theoretically be applied to mobile design, but has yet to demonstrate its practical effectiveness (Fitzpatrick, 2003).

This thesis partially addresses the situational differences which influence different kinds of mobile users, both in the Discussion section (see Section 6) and via research studies (primarily Section 3.5). The following section discusses a strategy for determining more accurate descriptions of context: let the user describe it themselves.

2.5.8 Self-reporting of Participant Perspectives and Behaviour

One method of approaching the difficult situation of an outsider attempting to enter a culture and describe it, is to have an existing member of the culture document it themselves. When used in a traditional anthropological context this is called autoethnography. It is a method of self-documentation where a member of the community being studied explains their world through their own eyes to external readers (Roth, 2005). It also goes by a variety of other names including personal ethnography and reflexive ethnography. The results of using this method are similar to traditional ethnography: long and detailed.

Other methods of self-reporting tend to be more focused and detailed, while retaining longitudinal characteristics and reducing the responsibilities of the observer. These methods are either contemporaneous or retrospective and fall on a spectrum based on how much time typically passes between an event and its being logged. For instance, a common self-report method is a questionnaire (see Section 2.6.1). When this method is used to understand behaviour it typically asks informants about things that have happened to them in the past. The more frequently the questionnaire is distributed, the more likely it is to be able to record events shortly after they have occurred.

Researchers in sexual health investigating rates of disease transmission are very concerned about the accuracy of self-reports; methods that do not result in rapid reporting of accurate behaviour have low credibility (Schroder, Carey, & Vanable, 2003). They mention a number of factors such as memory errors, frequency of behaviour and the social context of reporting behaviour as being key challenges. They recommend diary studies, which get short frequent responses from participants, as a superior method; however diary studies have their own weaknesses (see Section 2.6.2). More recently a variety of pre-existing methods and technologies have been combined into cultural probes, which also seek for participants to document their own experiences to help inform design (see Section 2.6.3). Another method called ESM uses alarms to prompt user feedback in an electronic fashion (Scollon, Kim-Prieto, & Diener, 2003). Other studies have furthered the idea of having participants automatically report simple aspects of their own behaviour such as movement (Ashbrook & Starner, 2003).

These methods reflect the larger trend towards increased use of self-report methodologies and the variety of them available. A survey of mobile research methods recently concluded that mobile device research was increasingly dependent on these methods, as the following quote illustrates.

> *…developing more technologically sophisticated and contextually appropriate ways for participants to provide their own field data is an emerging area in mobile research methods. In addition, novels ways in which complex data about use can be automatically extracted through mediated data collection methods are also a significant research direction (Hagen et al., 2005).*

Researchers are finding that the social and physical environments in which people use mobile devices are exceedingly complex and challenging to observe (Ito, Mizuko

& Okabe, 2003). This is driving the need to find methods where participants are able to report their own behaviour. These methods may also serve to determine what is important to mobile participants out of the limitless environments surrounding them.

2.5.9 Degrees of Mobility

The term *mobility* has been used to mean a variety of issues related to movement of people, devices, culture and identity (Katz & Aakhus, 2002; Urry, 2001). 'Mobile users' has been used both to mean users of devices which can be moved and users who move and use devices (Kaasinen, 2005). For example, some research is primarily concerned with the handheld technology itself and refers to the people using these devices as *mobile users* (Brewster, 2002; Gorlenko & Merrick, 2003). However, it would be useful to distinguish between users who *are moving*, users who *use mobile devices* (who may be stationary), and users *in mobile environments* (such as public transport), all of which are often conflated into the same term. Mobile device research covers a wide variety of different kinds of people, situations, distances and transport methods. This research is partially represented by the following examples (see Figure 7):

A. business travellers (Churchill et al., 2002),

B. backpackers living a mobile lifestyle (see Section 3.5),

C. cruise ship passengers (Yarnal, 2004),

D. infantry on a battlefield (Hicks, Flanagan, Petrov, & Stoyen, 2002),

E. motorcyclists riding around a city (Esbjörnsson, Juhlin, & Östergren, 2003),

F. passengers in cars travelling between cities (Vesterlind, 2004),

G. people using public transport in cities (Howell, Love, & Turner, 2005; Iacucci et al., 2000; Ito, Mizuko & Okabe, 2003; Tamminen et al., 2004; Weilenmann & Larsson, 2002),

H. personnel in snowploughs on airport runways (Weilenmann, 2001a),

I. visitors and residents walking in cities (Howell et al., 2005; Iacucci et al., 2000; Ito, Mizuko & Okabe, 2003; Tamminen et al., 2004; Weilenmann & Larsson, 2002),

J. a hunting party in the countryside (Harr, 2002),

K. visitors walking around a city park (Klante, Krösche, & Boll, 2004),

L. students sitting in a classroom (Jebeile, 2004; Zurita, Nussbaum, & Shaples, 2003),

M. medical staff walking in a hospital building, (Kjeldskov, Skov et al., 2004; Svanaes & Seland, 2004), and

N. museum visitors walking in a historic house (Woodruff et al., 2001).

In these examples users sometimes move in a stationary environment (e.g. a park) and sometimes are moved by their environment (e.g. a train). Sometimes they move infrequently and at slow speed, and sometimes they travel often or very rapidly. Some of the participants moved between rooms and others moved between cities.

The broad scope of mobility research provides diversity; but with it comes a lack of precision in understanding how mobile users are different from each other. Designing a system for a mobile user inside a stable car interior is very different than for someone jogging down a city street. The potential scenarios of technology use for the travellers I am studying are distinctly different to those for other types of mobile users. Distance, duration, frequency of travel, unfamiliarity with destinations, and lack of consistent modes of transportation suggest that backpacker behaviour falls into a category of *extreme mobility*.

2.5.10 Extreme Mobility

There are many factors which determine the extent which mobility influences the user. These are likely to change depending on the user and situation. Based on a review of the research and observations in the MIS studies, two significant variables appear to be the:

1. degree that the users' **environment changes** (regardless of the user), and

2. how fast or often the user **changes location** (movement).

These two variables can be used to map out a space as shown in Figure 7. *Change in Local Environment* is a combination of multiple locations used, transportation commonly used, freedom of movement, risk, predictability and other related concepts. *Movement* is a combination of frequency, distance, speed, and duration. *Extreme Mobility* is the top right quadrant where these variables are most challenging for the mobile user. The chart is intended to be an approximate method by which differences between types of mobility can be visualised, structured and discussed.

Quantifying these measures would be time-intensive, impractical and situationally specific; consequently it would not greatly benefit rapid design cycles and informal design discussion. The extreme mobility chart is similar to other conceptual graphs such as a triangular depiction of types of prototypes (Houde & Hill, 1997), which is useful despite its subjectivity.

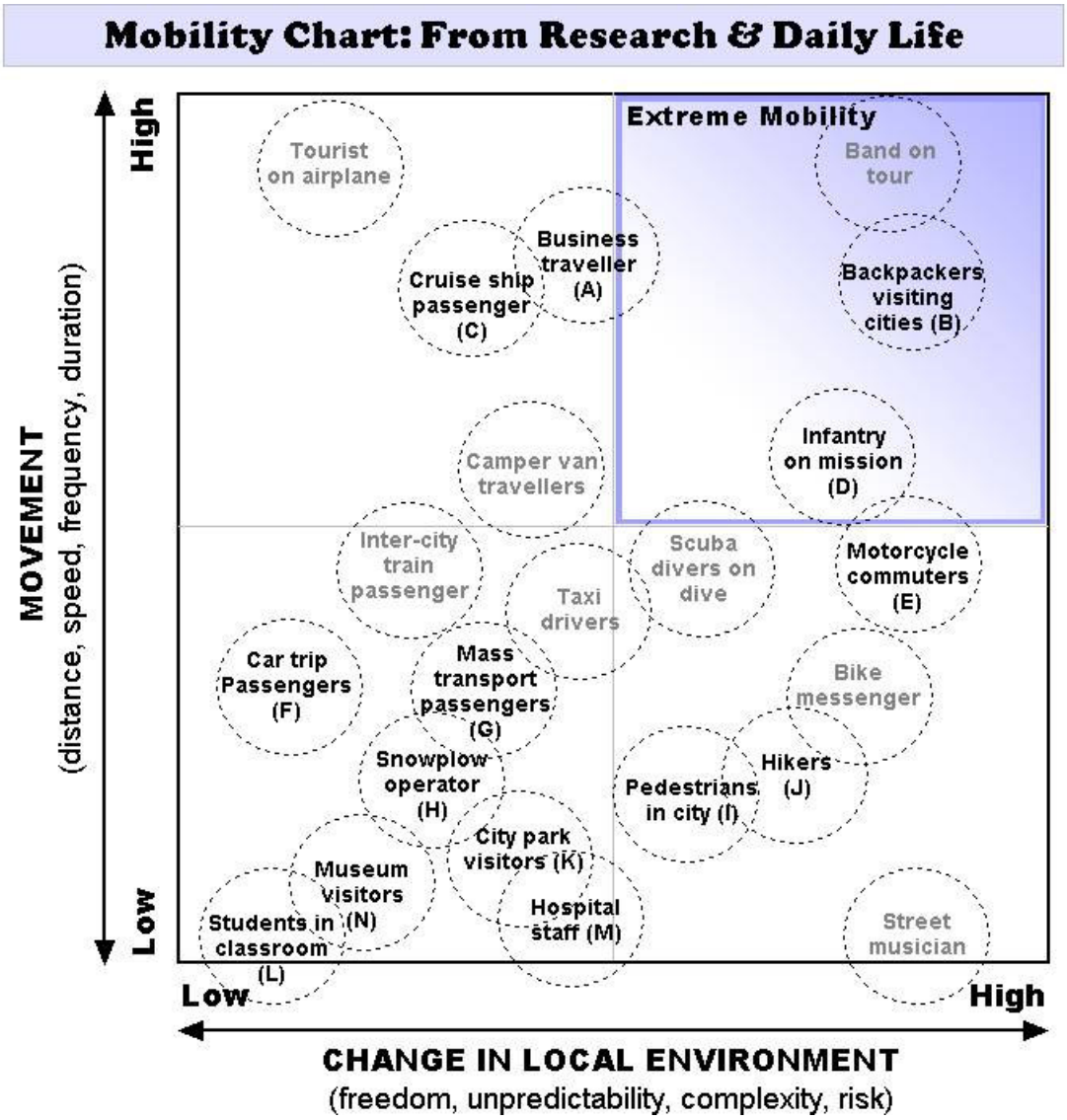


Figure 7: Extreme mobility is the upper-right quadrant where the variables *Change In Local Environment* and *Movement* are most challenging for the mobile user. Prototypical examples of mobile users are shown, with references for papers relating to them (shown in black) where they could be located. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-2.5-mobility-chart.jpg.

Use of this chart allows rapid visualisation of how certain types of mobile people have similarities and differences to other types of mobile people. For example backpackers

and cruise ship passengers, while dissimilar at first glance, have a high degree of movement in common (see Figure 7, B, C). They both travel worldwide, may have similar issues of isolation from communication networks and experience foreign cultures regularly. Likewise, backpackers and street musicians have a similar level of changing environment (see Figure 7). Some backpackers we have talked to carried guitars or worked handing out leaflets: a similar situation to buskers. Likewise, while museum patrons or office workers are often depicted as mobile, they are in much less extreme situations with small degrees of movement and stable environments (Figure 7). It follows that different methods and designs may be appropriate for these different kinds of mobile users.

Backpacking is an extreme form of mobility, in part because of the large degree of change in the environment and a high degree of personal movement. Our studies have shown that backpackers do frequently spend time in semi-stable transportation environments such as busses, trains and planes. However these are for short periods and many different forms are used. Backpackers are constantly surrounded by new people, frequently change accommodation, and have few secure locations available to them. They regularly re-evaluate new people, cultures and activities. They also move frequently; most spending between one and three days in a location. Sometimes they irregularly stop to work for longer periods, but this is often subject to chance and happens within a longer agenda of travel. Backpackers often travel for durations of six months to a year or more, exhibiting a continuous mobile lifestyle. Many backpackers cover large portions of a continent on a trip and sometimes move between multiple continents. The rate of movement is irregular and subject to many environmental variables. This is distinctly different from business people taking pre-arranged flights, hotels booked in advance and scheduled meetings (see Figure 7, A). Thus, technology for backpackers can not rely on the degree of supportive infrastructure available to less-extreme mobile users.

Producing designs for extreme cases of mobility is likely to find solutions which are also applicable to less extreme situations, where this degree of support is only occasionally needed. This high degree of complexity and change in the interactions and environments of mobile groups encourages the use of ethnographic methods in the design of devices to support them (Ruhleder & Jordan, 1997). Ethnography's in-situ and qualitative methods are well suited for this environment and are able to spot behaviour patterns which are useful for forming user requirements (Kjeldskov & Graham, 2003; Pinelle & Gutwin, 2003). Mobile researchers are likely to benefit from

identifying which kind of mobility they are researching before selecting from available methods which may only be appropriate in specific settings (see the next Section 2.6).

2.5.11 Summary of Theories and Frameworks

There are a wide range of theories and frameworks which are potentially applicable to HCI and design. A subset of these which are more user-centred and applicable to mobile or group settings have been covered here. This section has reviewed user centred design, ethnography, participatory design, action research, and social network theory. It has also discussed some other ways of conceptualising design issues or methods such as: formative and summative methods, the notion of context, and self-report methodologies. The section concluded with the identification of 'extreme mobility' and the differentiation of it from other forms of mobile behaviour being researched. No particular theory addresses all relevant issues and each emphasises different techniques and goals for design. It is likely that new theories and frameworks for mobile community research will form. These will adopt the components of pre-existing theories which are most appropriate for modern design settings and the needs of these users.

2.6 Related Methods

A variety of researchers are adapting more traditional methods for challenging situations such as mobile users. A review of traditional and recent methods is provided here, to give a historical perspective on the methods used in our studies with backpackers. The below examples are not a comprehensive list of all methods that could be used with mobile groups, but an overview of common methods. Methods usually work within a larger framework of theory as discussed in the previous section and there can be a blurred line between them. Advantages and disadvantages of each method are described below to show optimal applicability and opportunities for new methods to be developed.

The common methods of questionnaires, diary studies, probes and prototyping are reviewed first. This is followed by an analysis of the different kinds of mobility which have been researched, and the identification of a new category 'extreme mobility' which poses new challenges for mobile methods. The section ends with an analysis

of the structure of mobile group studies, which concludes that it is desirable to use methods capable of tracking all members, even when dispersed.

2.6.1 Questionnaires

Questionnaires are a standard data collection method for many research disciplines. For example, they are commonly used in marketing to gauge consumer opinions about future products or services. Questionnaires make it possible to sample sections of target demographics and enable statistical analysis (Rubin, 1994). They are often completed in private and then returned to the researcher. Questionnaires can be cheap to produce and resulting data is structured, frequently allowing automated analysis (Helander et al., 1997). They are also relatively easy to distribute via paper or electronic media. Electronic questionnaires provide the option of dynamically changing questions based on previous answers or user characteristics.

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

- recording participants' intended or perceived behaviour as opposed to actual behaviour,
- difficulty determining how questions are understood by participants,
- cultural differences in understanding and responding to questions,
- incorrectly targeted questions may miss important issues,
- multiple-choice questions are often used that do not allow participants to explain their answers or give contextual information,
- response rates are often low,
- those responding may be self-selecting, and
- questionnaires can be long and tedious to fill out.

For these reasons, questionnaires are both widely used but also viewed with a level of healthy scepticism (Higgins, McClean, & Conrath, 1985). Questionnaires are not typically associated with mobility studies, except in the modified form of diary studies

discussed below, or to rapidly collect data from participants before or after a mobile activity.

2.6.2 Diary Studies

Diary studies are a longitudinal method that allows self-reporting of specific aspects of behaviour, usually using a small notebook. They were originally used in a variety of applications including early social networks research (Conrath et al., 1983). Diary studies are often capable of operating in environments which would be difficult for an observer because of social or physical reasons. The method also removes some of the observer effect (differences in participant responses due to being observed), which can elicit more personal accounts and natural behaviour.

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

- self-recorded diaries typically understate the actual frequency of communication events,
- participants were more likely to record received rather than initiated communications, and
- there can be issues of only recording a subset of communications (e.g. work phone calls versus personal calls).

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

Modifications to the paper-based format were introduced in a study of mobile phone usage which incorporated voice-mail as the recording medium (Palen & Salzman, 2002). There are other variations on diary studies such as the Experiencing Sampling Method (ESM). An ESM-based study of interruption of managers used mobile devices to prompt the participants to fill out a short questionnaire several times a day

(Scollon et al., 2003). This does not rely on participant initiation, but still obtains situated feedback from users in a (short-duration) longitudinal fashion. Diary studies have a number of limitations, but they often fit well in challenging mobile usage environments and offer advantages over other methods (Schroder et al., 2003).

2.6.3 Cultural Probes and Related Work

Cultural probes are a method to gather information relevant for design from settings that present challenges to observational methods. Typically participants are given a variety of objects such as disposable cameras, notebooks, audio recorders, maps, photo albums, or postcards to record aspects of their life and environment. The method was originally developed during a project dealing with designing for the elderly (Gaver, B., Dunne, & Pacenti, 1999) and has primarily been used in domestic settings by its creators. The method was used again while developing technologies to support former psychiatric patients (Crabtree et al., 2003), who among other challenges tended to be paranoid about being watched. Cultural probes have also been used to understand mediated intimacy (Kjeldskov, Gibbs et al., 2004).

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

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

2.6.4 Low-Fidelity Prototyping

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

A large portion of mobile computer research is technically focused, with emphasis placed on technologies used, network design and implementation issues (Eagle & Pentland, 2005; Mohapatra, Gui, & Li, 2004; Pospischil et al., 2002). Consequently, mobile device development tends to feature more high fidelity prototypes. These systems are developed at high-cost: both in terms of time, money and effort to produce working proof-of-concept systems (Cheverst, Mitchell et al., 2000; Kellogg, 2002; Pospischil et al., 2002).

Low-fidelity prototypes are constructed with inexpensive materials such as pens, paper, clay, foam and cardboard. Use of these tools to make physical representations of design ideas is usually a rapid process. Additionally, inexpensive materials and the ease of discarding or modifying ideas encourages creativity and flexibility in early design stages (Ehn & Kyng, 1991; 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, 1991). 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) (also see Section 2.5.3). 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, 1991). 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). A recent paper reviewed three different ubicomp systems and discussed how varying levels of prototypes had been used and what they were useful for (Carter & Mankoff, 2005). They primarily concluded that an inordinate amount of effort was being spent building functional prototypes only to learn that basic requirements had not been met.

2.6.5 Structure of Mobile Group Studies

The majority of mobile research has focused on individual usage (for examples see (Beck, Christiansen, Kjeldskov, Kolbe, & Stage, 2003; Brewster, 2002; Chincholle, Goldstein, Nyberg, & Eriksson, 2002)) and most group research has focused on low-mobility or static usage situations (for examples see (Erickson et al., 1999; Hudson, Christensen, Kellogg, & Erickson, 2002; Olson & Olson, 2000)). However, emphasis on these individual foci miss the convergence of mobility and group interaction which is increasingly a factor in mobile device design (Pinelle & Gutwin, 2003; Weilenmann, 2003)

The following section discusses why more research studies which inform the design of mobile technologies should be group studies. This is followed by a simple taxonomy of existing mobile group studies, which is based on the number of perspectives and locations; this demonstrates that even though groups naturally have multiple and collective perspectives, many mobile group studies only use one.

2.6.5.1 Collective Use of Mobiles

Many features of ubiquitous mobile devices such as SMS, voice calling, and address books are primarily designed for use by a single person. A number of recent studies stand in contrast to this view of solitary usage and one-to-one communications. Studies of rendezvousing have shown multiple parties within groups coordinating their actions (Colbert, 2002, 2005). A study of Swedish teenagers found varied examples of sharing. These include calling one person's phone to talk to another person in the group, referring to the group state during remote conversation (or vice-versa), borrowing and lending, sharing visual and audio communications and turn-taking (Weilenmann & Larsson, 2002). Investigations of electronic guides have

shown people sharing devices and requesting output methods that permit monitoring by multiple users (Woodruff et al., 2001). Other studies have shown that remote people in the user's social network dramatically affect device usage and user behaviour (Gant & Kiesler, 2002). Thus, mobile device use may blur the distinction between 'direct' and 'indirect' users of technology often indicated in software engineering models (Jacobson, 1992; Mayhew, 1999). Instead, it may be most appropriate to view the phone as a collaborative resource used by a group. This means that sociability, in addition to usability, will be increasingly important (Preece, 2001). All of this adds up to the conclusion that mobile device research should be focusing on social networks of users and how they interact when using technologies; however there has been little work done in this area.

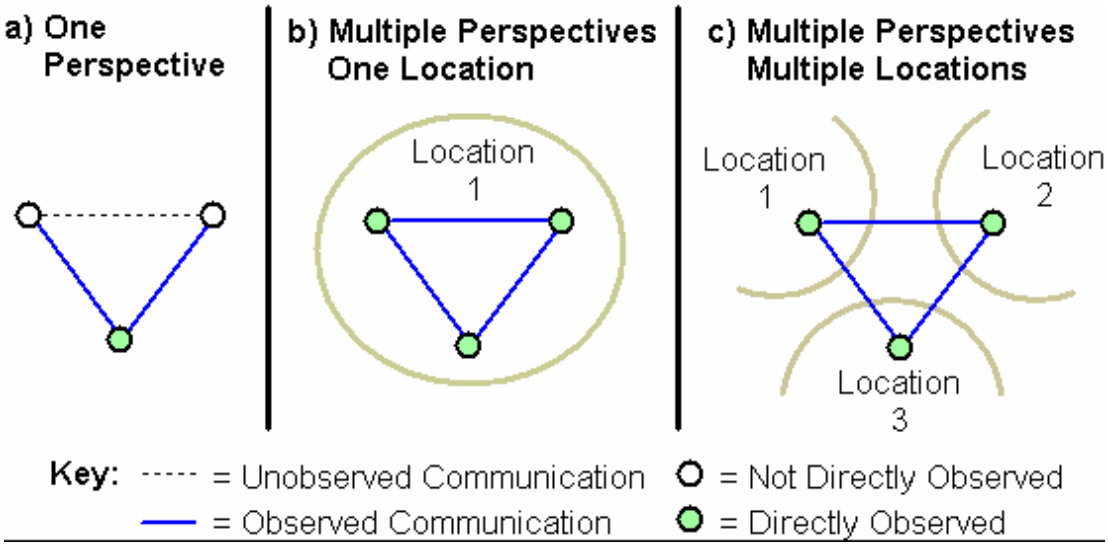


Figure 8: a) One person's perspective on the many; b) many people's perspective on the collocated many; c) many people's perspective on the distributed many.

2.6.5.2 One Perspective on the Group (a)

Some studies of mobile group usage use the perspective of a single member to understand the entire group (see Figure 8 a). For example, the above-mentioned study of rendezvousing used diaries from *individuals* which concerned how they felt during various stages of group interaction (Colbert, 2005). Similarly, a study of 17 mobile workers observed and interviewed each individual participant, but not others that took part in group actions with that participant. A similar structure was used in a study of mobile context which followed individual people interacting with remote others (Tamminen et al., 2004). A study of a small group of push-to-talk users watched individual users interacting within the group, but did not record collective

group communication or observe the entire group simultaneously (Woodruff & Aoki, 2003, 2004). Practical issues, such as group members moving apart often thwarts collective observation, as was the case of an ethnographic observation of a bird-hunting group travelling in formation (Carter, Mankoff, & Goddi, 2004; Harr, 2002). This may indicate that new methods are needed to overcome these issues, but it is clear that a portion of the group's usage behaviour and opinion are being lost with studies structured in this manner. In contrast, some studies look at multiple perspectives.

2.6.5.3 Multiple Perspectives on the Collocated Group (b)

Very few studies of mobile groups have examined multiple perspectives within groups or collective group interaction. Traditional ethnographic methods often enable observation of an entire group if they are collocated (see Figure 8 b). Some research has been done in this manner with mobile prototypes, such as a study observing a group's usage of mobile proximity detectors to maintain awareness of the location of friends skiing together (Weilenmann, 2001b). This study was able to observe simultaneous group usage in some situations. Several studies of mobile phone use by teenagers on public transport has demonstrated simultaneous observation of all group members and an understanding of resulting interactions (Ito, Mizuko & Okabe, 2003; Weilenmann & Larsson, 2002). Another study observed individual teenage mobile users who were sometimes physically proximate to their friends (Berg et al., 2003). This study also recorded photographs and notes of remote transmissions, providing some understanding of remote group members' interaction. Kaasinen also reports on seven mobile device studies which used a variety of approaches from watching individual users to observing collocated groups and contextual focus groups (Kaasinen, 2005) which helped to develop a group perspective. However, this becomes more difficult when group members are not in the same place.

2.6.5.4 Multiple Perspectives on the Distributed Group (c)

Studies of simultaneous usage by mobile groups is methodologically challenging, and particularly so when members are distributed (see Figure 8 c) (Weilenmann, 2001a). One study accomplishing this examined proximity awareness devices used to exchange information by a group of three motorcyclists (Esbjörnsson, Juhlin, & Östergren, 2004). Data was logged from the interactions and all participants were interviewed separately and simultaneously after device usage. Likewise, another study investigated the use of a portable audio space (walkie-talkies), and cleverly

recorded the communications of larger groups of users at a music concert (Strub, 1997). This allowed development of a detailed understanding of how different members of the group perceived interaction and affected one another. Another study examined a group of three people searching and rendezvousing while using a prototype discussion list (Axup et al., 2005). Three experimenters simultaneously observed participants, all group communications were recorded, and group discussions were conducted following the activity to understand group interaction and group awareness. Similarly, a recent study examined rendezvousing used a Wizard of Oz approach to simulate a location aware system (Reilly, D. et al., 2005). This study used one observer for each of the two participants, who were distributed and attempting to meet up. These types of *all-inclusive group studies* provide an opportunity to understand collective behaviour, group identity and normative development resulting from technologically-mediated interactions of distributed people.

Consequently it is reasonable to conclude that many mobile studies have been ignoring group usage, and that there are several strategies being used for the limited number of studies that do look at groups. Problematically, many of these strategies gain only a limited understanding of collective group behaviour. With more and more mobile devices connected to the Internet and worldwide cellular systems, it will become increasingly necessary to use methods which help understand how widely dispersed networks of people are influencing usage.

2.6.6 Summary of Related Methods

There are a number of methods, or classes of methods that are potentially applicable to mobile group research. These include questionnaires, diary studies, probes and low-fidelity prototyping. Studies specifically investigating mobile groups also often use hybrids, self-reporting methods, remote observation and multiple observers. Choosing methods to fit a specific situation is difficult and adaptation is often necessary to fit mobile settings. It helps to understand how mobile a situation is, and how the usage group is structured before choosing methods. For example, mobile usage which appears to be a single stationary user may have hidden mobile users. It is possible to use methods which examine this collective usage. The process of choosing these methods and modifying them as needed is discussed in more detail in Section 6.2.

2.7 Conclusion of Literature Review

Due to the multi-disciplinary nature of this thesis, the literature survey has covered a variety of relevant topics to a moderate depth. The culture and habits of backpackers have been reviewed to provide an understanding of the mobile community being studied in the majority of the research presented in this thesis. Common habits, situations and problems of backpackers have been identified, and discussed as requirements for tourism product design. This section was followed by a review of the various technologies currently being used by backpackers (e.g. SMS, blogs, cameras) and those that could be relevant to future designs (e.g. Bluetooth). Some of these technologies such as MoSoSo, moblogging, and location-aware guides are likely to have an impact on the backpacking market in the near future.

Various themes in mobile and CSCW research have been discussed. These included the differences between groups and communities, the potential to influence group behaviour with design, and current methodological and research related challenges for the field. These are some of the overarching issues which encompass the routinely conducted activities in mobile development. These activities include: conceptualisation of new products, requirements engineering which determines what products should do and confirms they do it, and communication of these requirements within design teams. These activities in turn both influence, and are influenced by, theories and frameworks.

There are a wide variety of different theories and frameworks which sit above methods and guide their usage and creation. Some of these include user centred design, ethnography, participatory design, action research and social network theory. Other thorny concepts such as context, which is still the source of much debate due to its abstract quality, and mobility, which relates to most of human experience have also been reviewed. The chapter concluded with an assessment of existing methods. While not comprehensive, this covers some of the more recent and relevant methods used for designing for mobile and group devices. These include questionnaires, diary studies, probes, and prototyping. The methods section concluded with an in-depth review of mobile group studies which argues that too few of these studies exist and that there is insufficient focus on collective group usage. This review of theories, frameworks and methods helps to justify why new or modified methods have been created as part of this thesis work and how they relate to existing systems.

The next chapter describes the intent and theoretical background for the research studies. It discusses the underlying theoretical orientation guiding the choice and generation of methods used. A map of the research studies is also provided to help describe how various methods investigated different aspects of backpacker culture and the design space. The intended audience and the structure of the thesis are also explained.

3 Research Studies

With the wide range of methods covered in the previous literature review, it is clear that there is a large 'methodological and theoretical toolbox' to choose from. This chapter first explains some of the theoretical underpinnings of the research. Following this is a discussion of how multiple methods were used to gain different perspectives on the design space. The remainder of the chapter discusses the five research studies conducted. A section focuses on the methods, results, and a brief discussion for each study.

3.1 Theory and Background for the Methods

This thesis is intended to address mobile group research methods. Backpackers are a convenient and interesting user population which facilitated trialling of the methods and provided challenges to existing methods. Consequently the focus of the thesis is primarily on methods; design results or understanding of backpacker culture are important components, but constitute secondary concerns.

Every method used in the research for this thesis is in-situ. This means they all engage with users (either directly or indirectly) in something approximating their natural environment. Where possible, it was attempted to co-develop ideas with them in an environment that was as ecologically valid as possible. Since the research concerns mobile groups, I attempted to use groups whenever possible, and to perform studies while mobile when possible. However, this can be difficult, and a component of this research concerns strategies for addressing these challenges. There has been increased concern in the mobile development community that testing outside the lab and in realistic environments is needed, and this research was focused on exploring that space.

I personally have an interest in mobile devices over other forms of technology. Since this research is exploratory and primarily related to requirements analysis, I received feedback from backpackers about many different types of proposed technologies.

For example backpackers in the MIS studies (see Section 3.5) mentioned information kiosks and public displays which could be either at the hostel or the animal park. While these ideas are reported, they were not the primary technological focus of the research. This bias exists because of the personal interests of the author as well as the difficulty in implementing non-portable devices in all of the places backpackers go worldwide. An additional technological bias was towards producing a group-communication product. This formed for several reasons. First, it is the communication products (e-mail, SMS, VOIP, RSS) which have proven to be the most disruptive, easy to adapt, and popular on the Internet. Second, it is immediately clear when backpacking that a communication system amongst backpackers is sorely lacking. The research has remained open to other requirements and mobile tools, but they were designed to investigate the communication habits and needs of a mobile community.

This research focused also on using and exploring user-centred and iterative processes and methodologies. Most modern software development practices now incorporate aspects of this, so it is not particularly controversial. However it does shape the methods used, all of which required users to be an integral part of the process.

The research presented in my thesis is not PD in the strict sense (see Section 2.5.3) It was not specifically designed with a philosophical intent to empower certain users, to avoid replacing people, or to have users co-determining the outcome of all stages of design. However, this research is ‘participatory’ in that it involves users extensively, engages with users in their natural environments, and does seek to provide useful tools for them. Whether this is sufficient to fall into more modern definitions of participatory design is unclear, but it is certainly user centred design. When ‘participatory’ is used in this thesis it is used in the less-strict sense.

There is a similar distinction between a strict definition of ‘ethnography’ (see Section 2.5.2). Traditional ethnography was practiced by anthropologists and involved fieldwork living within the cultures being studied for long durations. The term is now commonly used to mean a study of sufficient duration which takes place in a reasonably natural setting and observes natural behaviour (see Section 2.5.2). Some people use ‘field study’ to refer to this type of research (Lofland & Lofland, 1995), but it is similar in intent to traditional ethnography and this new form of ethnography is now being applied in a vastly different domain and for different purposes. It is seldom practical to conduct modern technology development studies that last years and that

do not introduce new product ideas. Thus, I will use the term ‘ethnographic’ instead of the more pedantic ‘ethnographically-inspired’ within this context.

A great deal of this research discusses communities: both how they naturally operate and how to design for them. When sociologists examine community they tend to use quantitative methods which gain high-level understandings of collective behaviour. My research has used smaller samples, and in many cases first-hand observation. This introduces the question of whether this research is studying groups or communities. It is my belief that group behaviour is very different from individual behaviour, and that groups are part of the foundation of communities. Thus, studying the details of how *groups* operate and use technologies is one (but not the only) useful method of gaining insight into designing for *communities*. However, some of the research on blogs in Section 3.8 has rounded this out with quantitative high-level analysis of an entire community.

At least five different research methods have been used and each one looks at a different aspect of how mobile groups and communities function. The following section shows how the methods balance each other’s strengths and weaknesses and explore different parts of the design problem.

3.2 Multiple Methods For Different Aspects of the Research Situation

Research methods have different strengths and it may take multiple methods to gain a good understanding of different critical factors (Mackay & Fayard, 1997). Two factors that are important for backpackers are 1) group structure and 2) duration of interaction (Richards & Wilson, 2004). Some research methods work better for collocated or distributed groups (Weilenmann, 2001a); others work rapidly or observe participants for long periods of time (Millen, 2000a). Accordingly, the methods chosen for the studies presented here were structured to explore combinations of the variables of ‘participant structure’ and ‘duration of interaction’ (see Figure 9).

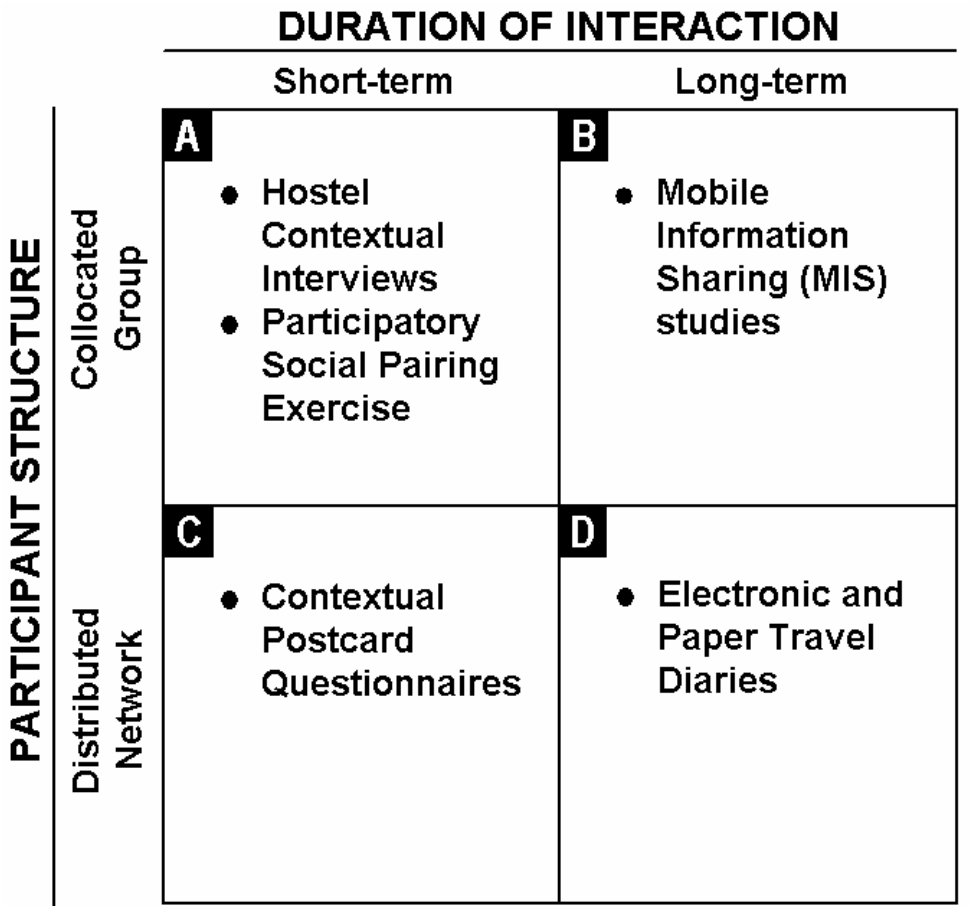


Figure 9: Methods with different strengths were used to explore different aspects of backpacker behaviour.

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

‘Short’ and ‘long’ are relative terms. Here I show the MIS studies which were about eight hours in length as being long term. Paper travel diaries covering up to several years are also in the long-term category. It depends on what methods are used and why they are being used as to what is short or long. For detailed shadowing and recording of mobile participants who leave town in a day or two, eight hours *is long* and produces a large data set. The short-term methods typically lasted 10 minutes to an hour while participants filled out a form or took part in an activity. Whether a specific method is short or long-term is less important than the consideration that

both short and long-term behaviour for a given type of user are examined, probably by different methods.

The distributed or collocated categories are more self-evident. Groups sticking within eyesight or voice range are collocated. Those that move farther apart, or connect to remote members of their social networks are clearly distributed. However, there is a category of loosely-coupled groups (Pinelle & Gutwin, 2003) which regularly transition between collocation and distribution. This was partially the case for groups of participants in these studies, but they were primarily collocated.

The remainder of the chapter demonstrates how the methods above targeted different aspects of the users' behaviour. This resulted in different viewpoints on the design space and different kinds of data to inform requirements.

3.3 Introduction to the Research Studies

My doctoral research began with a general interest in mobile CSCW and community interaction. Backpackers were initially identified as an example of a mobile community to conduct my research with. Preliminary research activities included determining which methods would be appropriate. In some cases existing methods seemed reasonable, but in many cases I had to devise new methods to fit the situation. It then became clear that there was enough of a research problem in the area of research methods for mobile groups to support a thesis.

The remainder of this chapter covers five research studies conducted as part of my doctoral program. Each section provides an introduction, method, results and discussion of a study. They are presented roughly in the order in which they occurred because this demonstrates the iterative development of the methods and better demonstrates their origins. Where possible, the conclusion of each study lists design recommendations, resulting user requirements, and potential product ideas. Discussion which pertains directly to each study is provided in this chapter; that which encompasses multiple studies or addresses broader issues is in the Discussion (Chapter 4.8).

The research began with broad introductory studies which mapped out the design space and determined high level concerns. This helped determine design issues, as well as methods of interacting with backpackers and those who work with them (e.g.

hostels, travel agents). This set the stage for more detailed studies of the mobile community of backpackers and potential mobile device designs for them.

The remainder of the chapter is structured as follows. Section 3.4 discusses the initial interviews with backpackers at hostels and corresponding site visits. After this is the Mobile Information Sharing (MIS) study which provides a look at the natural behaviour and communication of mobile groups of backpackers, and investigates how mobile prototypes are used in this environment (see Section 3.5). The next section presents the participatory social pairing exercises (see Section 3.6). This addresses two activities run after each of the MIS study iterations which tested a prototype of an automated social-pairing system. The section after this covers the contextual postcard study (see Section 3.7), which utilises a method of remote sampling the place-based perceptions of backpackers. The last section (Section 3.8) covers my longest running study (two years), which began with paper travel journals and ended investigating online travel blogs. This concludes the studies conducted for this thesis. Chapter 4 and succeeding chapters provide a detailed review of the methods, discussion of broader issues, and conclusions.

3.4 Research Study: Site Survey and Contextual Interviews

This section presents results from my studies of backpacker culture, and identifies gaps where future technologies could assist backpackers in existing situations. The research included contextual interviews with backpackers, tours of hostel accommodation, and short reviews of online discussion and blogging sites. This research was intended to explore the design space and identify major issues to address in further studies. Backpackers discussed problems they had, typical situations, technologies they used and other issues. Results are organised into themes, ranging from discussions of how backpackers meet each other on the road, to how they use mobile phones. These discussions indicated a need for mobile devices which can help a social, distributed community to connect and coordinate.

The following sections cover the method, results, and discussion of the results. An overview of backpacker culture has already been provided in the literature review (see Section 2.1).

3.4.1 Method

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

In Hostel A, flyers were handed out in the morning and interviews were conducted on a porch outside the communal kitchen and TV room. Backpackers were invited to discuss the backpacker community, communication patterns, travelling habits, travel gear, and recording and sharing of travel experiences in a loosely structured format. Backpackers were approached in-person and interviews were conducted steadily throughout the day. Notes were taken directly at the time of interview on a small laptop and audio was recorded on a portable MP3 player.

In Hostel B, flyers were handed out directly to backpackers which usually led immediately to an interview in the same format as above. A short participatory activity was also conducted with three participants, which used a ‘social network board’ with a circular graph layout to elicit social tie information (see Figure 10). The graph is drawn on a sheet of foam-core and uses sticky-notes to show relationships between items. Three types of graphs were suggested to participants which included: 1) frequency of communication, 2) emotional bond, and 3) physical distance. For each type of graph, participants were asked to position ten smaller sticky notes on the graph which contained items such as: friends met while travelling, family, and friends at home. Participants were also invited to create their own social groups or types of graphs. Photographs were taken of each completed graph and then the board and notes were re-used.

Figure 10: Social Network Board

Audio recordings of the interviews were reviewed later for quotes and additional detail, but were not fully transcribed. In most cases the hostel environment was reasonably quiet and recordings were of sufficient quality. Pictures of the social network boards were reviewed for common trends. Pictures of the hostel were primarily used to communicate the environment in reports, as I have backpacked before and am very familiar with the hostel environments depicted in them. However, photographs of the message board postings were used analytically, and were cleaned up in a graphics program to enhance legibility (see Figure 11). A detailed spreadsheet recorded the message content, intention for posting, physical location, hostel, city, picture filename and whether it was posted by a backpacker or a local resident. A review of this data resulted in a number of trends, an understanding of common purposes for posting notices and frequencies thereof.

As part of the process of understanding what backpackers were doing outside of hostels and how they were locating hostels, a series of online discussion forums

frequented by backpackers were also reviewed. 183 topic titles from five discussion forums were analysed. The following categories resulted from a bottom-up, grounded theory (Strauss & Corbin, 1990) style approach to reviewing the titles. Duplicate topics were removed and one topic I had posted was removed. Some topics fit multiple categories and were counted in both. A subset of these discussions was also reviewed qualitatively.

Tours of five hostels were conducted and recorded with photographs. The photographs represent a fairly typical hostel environment in which many backpackers spend a significant amount of time. They show locations where communal activities happen and services which are offered to residents. Special effort was made to locate message boards inside or outside the hostels and take photographs of postings on them (see Figure 11). This was due to our interest in building an information sharing system and a desire to review existing methods backpackers' used.

Figure 11: A hostel notice board which has been enhanced for analysis purposes.

3.4.2 Results

3.4.2.1 Who is a backpacker?

Backpackers commonly differentiate themselves from other travellers and other members of society. They have a common bond of doing a similar travel activity, and also a shared desire for exploration (see Figure 12, Figure 13). One informant said “backpackers as a rule are adventurous people". They tend to be independent and enjoy their freedom. For example, one experienced backpacker who had travelled for five years said “[I] like doing things at my own pace." Backpackers tend to be more “into each other", interested in learning, and open minded. They often spend large amounts of time talking about their experiences and learning about each others’ cultures. One said, “everyone is looking to meet new friends.” They also tend to be not just open to new ideas, but “openly expressive.” They frequently have opinions on various topics and are interested in sharing them in an open manner.

Figure 12: Beachcombing.

Figure 13: Communal dinners.

Backpacking offers a freedom of identity and a choice of how to present oneself. As one backpacker observed, "When [you] turn up on the door, nobody knows anything about you. Nobody can judge you. They know nothing about you. There is a new book to be read." Backpackers are often in their late teens or early twenties and correspondingly the flexibility to reinvent or “find oneself” is a common theme. The ability to avoid judgment from those who know the individual well leads to the “freedom to express yourself, however you like" which is often used by these travellers.

Backpacking occurs in a variety of different ways. Many people work while they travel, while others do not. Some travel for short periods of a month or two, while

others travel for years. Some jump quickly from place to place, while many stay months at a time in one city. The latter type was referred to by our informants as “long-termers.” Backpackers often pride themselves on being different from others in society. In particular, the sociability and openly-trusting attitude of backpackers is seen as a positive trait that is different from others. As one backpacker commented, "[I’ve seen] people on the bus for thirty years who have never talked to the person next to them. Being social is becoming intrusive for people. [Being] withdrawn is the norm." Backpackers commonly strike up conversations with others and share information, which is part of the travelling culture. One commented that it is “hard to find natural people in the ‘real world’.” This separate quality led one informant to refer to backpackers as a "travellers cult."

They travel for different reasons. Exploration, discovery and “searching” are common reasons given. Some travel because they “have problems at home” which they can avoid or get new perspective on. Others simply look for new experiences or to avoid becoming “unadventurous or boring.” One described them as a “special breed of people who have a passion to do this thing” and said "It is not about putting it into words, it is an emotional psychological journey."

Backpackers mix with other travelling groups and do not have strict boundaries on the term. One Australian traveller interviewed at the hostel did not consider himself a ‘backpacker’ because he was not foreign. Other people that mix with backpackers are itinerant workers who live for long periods in a city, but use the cheap accommodation services. It is often difficult to distinguish between these people and backpackers who are simply staying in one location for a while. Tour groups, or travellers moving at a fast pace, with a lot of money, or on short travel holidays also mix with backpackers frequently. It varies from traveller to traveller as to whether a given person is ‘really a backpacker’. Long term travellers tend to be more critical of including less experienced or adventurous travellers in the definition.

3.4.2.2 Community

Hostels differ, but they commonly provide a stopping off point for between a day and several months to backpackers. They are sometimes described as a "home away from home" but are often simply places where people “drop stuff, sleep and leave.” The backpackers interviewed were not particularly comfortable with applying the term ‘community’ to what they experience. They tended to use “family” related words to describe smaller-scale groups. One said, "it is nice to have a group of people that

you associate with, a group of friends, or even a family at times." Backpackers are aware of other hostels and backpacking groups within a city, but do not often associate with them unless they move hostels or need to advertise something at these locations.

There is commonly a distinction made between different kinds of hostels. For example, YHA hostels have a more organised and sanitary reputation, while independent hostels in city centres often have a party image with the assumption of less atmosphere and community. One experienced backpacker said “[In] other places (city hostels) you are packed in like sardines … I do not consider staying in backpackers in a city." Smaller hostels can be quiet, homey and personal, but it depends on the hostel (see Figure 14).

When specifically asked about communities amongst backpackers, responses often revolved around extended family, smaller-scale groups and time to get to know people. One said, "I think people create backpacker communities wherever they go" but that there is "not a backpacker community in the world." Another indicated that it might be more of an emergent process. "[You] do not realise you've started a community. You get drawn in." Some informants discussed groups of around 10-12 people who were in a particular place and where relationships formed and communal activities were common. "It ends up like family for a while", said one backpacker describing cooking dinners with new friends in Fiji. In these environments many activities are shared which probably serve as a foundation for trust formation, bonding, sharing and other social ties. "They cook dinner for you, even when you're not invited." said one backpacker, “It is more fun, because you're sharing the experience with others.”

Figure 14: Carrying possessions into a budget hotel with shared rooms.

Figure 15: Hiking in a group.

"People here take care of other people" said one backpacker about these groups. Sometimes the hostel staff play an almost parental or ‘older brother’ role in introducing newcomers, providing assistance, and occasionally enforcing rules. Hostels are not always the environment where these family-like ties form because certain countries have beach huts that are more private, houses are sometimes rented, and campgrounds can also provide communal space.

Sometimes it is literally a biological family which is travelling and which becomes part of the traveller’s extended family. One informant was 15 years old and in town with her father as a brief holiday. Another informant was 16 and staying with her mother to work. It appeared this was connected with a domestic abuse situation at their home in another country. Another woman I spoke with briefly was around 40 years old and was travelling with her daughter in her twenties. They had been travelling for six weeks together. It is accepted for backpackers to travel with parents, but is not a common occurrence. However, if backpackers travel long enough they often meet up with biological family members at some point.

3.4.2.3 Time to enter ‘the family’

These “big families” are often described as taking a month or two to develop. New friendships occur at different rates depending on the situation. One backpacker indicated that “It depends on the people , 2 weeks, sometimes a month or two. 1

week if really special person." Presumably this allows time for trust to develop, and several people mentioned longer time periods to "get to know them."

It is likely that the type of conversation between people changes over time. From personal experience, the questions "Where are you coming from?", "Where are you going to?", "Where are you originally from?", "How long have you been travelling?" are very typical conversational openings (see related results from the MIS study in Section 3.5.2.7). One of the reasons given for travelling in groups (see below for more detail) is the ability to move beyond repetitions of introductory, superficial conversations. One traveller who liked moving in groups said, "[You] learn more about people in a month." This may provide more intrinsic interest to people engaged in the conversations and allow conversations about more complex topics. Some backpackers I talked to spoke of families forming in beach houses, where larger groups got to know each other and share activities over a month or more.

3.4.2.4 Communal activities

Communal activities often come up in discussions of what backpackers do and how family experiences develop. For those backpackers that travelled with a tent, camping was a shared activity (See Figure 15). Although not discussed, presumably the rituals of setting up camp, taking it down, sitting around fires and cooking activities are a necessity that leads to bond formation and communication patterns. Some informants travelling or living with others discussed shopping for food or other items as shared experiences. Food is a large part of many cultures, and sharing breakfast, or the preparation of meals was commonly mentioned by those we interviewed. One person mentioned, "[There is] a barbeque on Sunday. I help out with it." Others mentioned shared spaces of houses or portions of houses such as "hanging out with people on the balcony."

Modes of transport frequently result in being communal activities. One girl recounted a story of waiting for a "shuttle" to get into town only to have a pickup truck with a flat bed arrive. She and her travelling partner, with several other German backpackers shared a memorable and presumably uncomfortable experience together. One backpacker emphasised the "time critical nature" of these activities. They often happen by accident or chance, and timing greatly determines how they unfold.

Various forms of entertainment are common communal activities. In cities this can take the form of trips to pubs or nightclubs. Games such as scrabble and cards are played, and movies are available in many hostels.

3.4.2.5 Sharing

The concept of sharing came up in many interviews and appears to be a necessary and important part of backpacker culture. A frequent type of sharing is that of information. Talking and swapping of stories, advice and rumours is often the foundation of travel plans. For example, one person commented, "All the places in Fiji we went to because another backpacker told us to go there." Local knowledge is frequently needed in new places, and in my experience, is more highly prized and difficult to get. As problems necessarily arise during travel, advice and support from other backpackers is commonly shared. It can also be lonely to travel alone and simply sharing company is a common gift between travellers.

Many items that backpackers carry will end up being shared or traded. For instance, one backpacker spoke of a “clothes tree” which female backpackers traded “clothes they were sick of.” Book trading, giving and selling are common events. One informant brought up the problem of getting the books that everyone else did not want. Someone ends up with these books and then has trouble trading them to others. Another backpacker mentioned that they read books they otherwise would not have via trading with others.

Figure 16: Eating around a campfire.

Figure 17: Meeting locals.

Travel and camping equipment is sometimes shared. Transportation is often shared and bulletin boards commonly have ride-sharing offers. One person said “[If you] got spare seats, offer them for money.” Taxis are another common item to share when going to and from transport centres or in urban areas. Reasons given for sharing transport included “exchange of petrol money, new stories, music swapping.” Job opportunities are often shared amongst stronger connections, and gossip about the

quality of jobs is common. One backpacker had heard that picking Zucchini was particularly bad work.

Food is commonly shared amongst travel groups and amongst “family groups” that form (see Figure 16). As people come and go frequently, they often have food items which would spoil or are too large to carry in a backpack. These items are often donated for communal use. “Doing favours” for others around food and meals activities is common.

For travellers staying longer periods, housing is a shared resource. The hostel is the more legitimised version of this, with various other kinds of housing supplementing or replacing it in some cases. A hostel usually has both private and shared rooms, but the latter are most common for single travellers in Australia. A small portion of backpackers might fall into the category of homeless, transient or vagabond at times. These people may not have enough money left to travel, have fallen on hard times or simply want more freedom than structured living solutions allow. One of the backpackers interviewed probably fell into this category at times, but he was currently at a hostel.

Barter and the sharing of drugs (cigarettes, alcohol, and sometimes marijuana) is fairly common. One girl said, “"cigarettes are like money." She also related a story of several girls working at a local establishment where "part of their payment for work was in cigarettes and booze." For this research, I sometimes exchanged sweet biscuits, a few clove cigarettes, a lunch and local information, for what they were telling me during interviews.

Several of the backpackers who were interviewed carried cameras. They usually gave reasons of wanting to record their experiences or share them with others. A common reason given to share photographs with local friends is to show them where they can travel to. One backpacker frequently used his digital camera’s LCD screen to show pictures to other travellers, and sometimes he connected it to a TV or a laptop to do informal slide shows.

3.4.2.6 Non-family members

Most, but not all of backpackers are highly social. Those that are not are referred to as ‘loners’ or ‘non-joiners’ and one backpacker said that “they read books in their room.” Some of these people travel alone and “go on walks” or other solitary

activities. From personal experience, some travelling couples can fall into this category. Also, language differences can be a reason for this.

3.4.2.7 Stable and transient members and time of participation

The use of a ‘home base’ came up with several informants. If backpackers are working in an area for a while, or want to leave large items behind while they go on short trips, they can find a stable base location. People who stay longer can get stronger ties with the local community. One backpacker said, "they end up staying somewhere for a longer period of time. I do not know any backpacker that just backpacks from one place to another. They always find a base, and work from there, and then travel back." This alludes to the underlying definition of a backpacker as someone who wants to live in the culture for a while as opposed to simply travelling through it.

“Long-termers” often include people working at a hostel (who were often backpackers staying there previously), travellers working in the area, and sometimes other members of the neighbourhood who spend a lot of time at the hostel. One woman not staying at the hostel had dropped in for lunch and indicated that she still received mail there from previous stays. Long-term friend networks can result from travelling. "I've stayed in touch with people I met 5 years ago", said one traveller.

3.4.2.8 Travel methods

There are a range of travel options available to the backpacker: bus, train, airplanes, boats, ferries, minibus, ride-shares, hitchhiking, walking, subways, taxis, and motorcycles/scooters are common (see Figure 18). This topic was not discussed in detail during these interviews, but one backpacker discussed his preference for car travel. He liked being able to stop anywhere they wanted and look at waterfalls or other interesting sights. He thought that travel by bus made one "stuck to [a] schedule, stuck too much in one place." The freedom to change plans, follow rumours and travel without a strict itinerary is a common theme when talking to backpackers.

Figure 18: A group transit option.

Figure 19: Swimming with other travellers.

3.4.2.9 Travel style: alone versus couples versus groups

One couple travelling together said they "did not expect to travel in groups", but did. Joining up with others is a common way of meeting people, sharing costs, and having more fun. Many of those interviewed mentioned the importance of having “someone to share the experience with." Travelling alone can be lonely and the need for company is a regular motivation for collective activities (see Figure 19).

Groups seem to be largely ad-hoc in that they form and disperse quickly in some cases and are largely due to happenstance. One person said they met people who "latch onto a group", but travel alone. A typical reason for groups to form was that they were "leaving at same time" and going to the same place.

One backpacker I talked to was European and was in part travelling to improve his English. He liked travelling in small groups of two to four people for a variety of reasons. One reason was the ability to learn more about people while travelling for longer periods with them. He also got to have more conversations and practice English. He indicated that there can be personality issues travelling with others, and it can "force some fights." He thought it was “better to share” the travel experience and that he "needed some company."

Another backpacker who planned on leaving to travel in two months (after finishing work), indicated that she would probably travel alone. She did not want to rely on the uncertain prospect of waiting to find another person going the same direction that she was compatible with in order to have a companion. However, she had met

Australians while staying in Brisbane and planned to visit them while travelling to provide a form of companionship.

3.4.2.10 Running into the same people

Stories of backpackers running into to each other at much later times in dramatically different locations are commonplace. Some of this is attributed to the “desire to do similar adventurous things” as well as hostelling networks that send everyone to the same locations. Some people specifically avoid ‘the backpacker trail’, but they still have an increased likelihood of running into other backpackers doing the same thing. One couple travelling in Fiji indicated that the small size of the island was a factor. “[It] was tiny, we ran into a lot of the same people". She saw someone familiar and said, "Did not we see you on the street in Suva?"

One backpacker told the following story. “I came back [to this hostel] and there were three people here from a year ago, one of which turned up a day after I did, and he had left two days before I did. It is just uncanny. But you find that all over the world. The world is not that big." He told another story from a previous trip to Brisbane. "[I] met a girl from Austria when I was in Germany. Came back here [and went to] a night club. Was not even going to go out. Bumped into this same Austrian girl. She needed a place to stay. She's now married to another backpacker we met in Germany.” He had a spare room open up the day before and offered it to her upon meeting her at the night club.

Another informant had run into a girl who worked at the hostel in the small town of Karina further north. Another girl at the hostel was from Melbourne and had found another Melbournian to talk to who was staying at the same hostel. Similarly, during my own travels, I was once was in a small collection of beach huts on an infrequently used island in South Eastern Thailand. A guy sitting at the table next to me whom I had never met before, was from my home town, had gone to my high school two years after me, and was working in a similar field. We are still in touch three years later. It is these seemingly improbable, but in fact likely meetings which provide a degree of entertainment and surprise to one’s travel experience.

3.4.2.11 Problems

There are many difficulties in backpacking which depend largely on the environment being travelled in. Backpackers have developed methods of dealing with most of them. Some problems which turned up during interviews included rain, insects and

finding transport. Also, finding places to access money, and having enough money to travel are constant concerns. Losing items is an issue because backpackers change location frequently. Thus products that are cheap and multi-purpose are useful. An example of a product which solves several problems at once is a sarong. The travellers from Fiji used it as a shower towel, beach towel, in place of sheets in dirty hostels and for changing in public places. Finding people to travel with can be difficult and learning whether you can trust them is also an issue.

Figure 20: Low-budget transport.

Figure 21: Trying new things.

3.4.2.12 Services used

One of the most commonly used services at hostels is the Internet. "Everybody has an email account" and staying in contact with distant friends and family is common. Hostels typically offer some kind of bus service to get travellers to transport centres (e.g. train, plane, bus) and sometimes to pubs or nightclubs (see Figure 20).

Several backpackers we talked to used hostel services to find work. One traveller had sold a car, bike, stereo and camping gear to other travellers via bulletin boards. They are also used to find other people to travel with. Others said they used services when “they were looking for something.”

3.4.2.13 Budget

Many backpackers work while they travel. This can happen in legal or illegal ways and gossip about which jobs are preferable and pay more is easily available. Most work is manual labour. To illustrate the variability and casual nature of backpacker

employment, one person interviewed had worked at a hostel, cleaned dishes, done some gardening and labouring, and was about to start a job mounting lighting equipment. Many backpackers leave their home countries with fairly small amounts of money, expecting to work in the host country as they go and experience the culture more by doing so.

Looking for work, or finding inexpensive places, can be a strong influence on travel plans. As one informant said, “Everyone hears about the cheap places to go, and then everyone wants to go there." Research had shown that backpackers spend more money than the average traveller, but they travel for significantly longer (Tourism Queensland, 2004). This means they are "on a real tight budget", as one person put it. One couple had an option to spend a small amount to cover all of the boat costs to travel between a series of islands. They said it cost, "$110 American, which is not expensive if you think of it in a vacation sense, but in a backpacker sense, that is all the money in the world."

3.4.2.14 Problems with travel information and gossip

Word of mouth testimonials between backpackers is a frequent method of determining where to go. Sometimes this is effective and sometimes not, and part of the challenge is in learning to determine which is which based on experience and character judgments. One informant told of hearing a report of a good resort on an island with excellent food in large portions. When they arrived they found it to be considerably below their expectations. Informal chatting can result in the ability to find other travellers. One informant was familiar with a lot of residents in a small Australian town. When he was away, a friend called him to tell him that a girl he had been travelling with had checked into a hotel. He was able to give her a call 30 minutes after she had arrived because of his social ties. Social networks can convey information very effectively, and in this case it was disturbing for the girl who had not expected to be tracked.

The Lonely Planet guidebook is the “bible of the backpacker" is a commonly heard phrase. Guidebooks are carried by almost everyone, with the exception of a few who use free, local city guides or work entirely off word of mouth references. Guidebooks do have problems. "[The] Lonely Planet was just a little old". (It was 3 years out of date.) “The details are not always right. Everything was off by $4-5.” Some backpackers use guidebooks as the foundation for most decisions while others distrust the editorial comments and use it primarily for maps or phone numbers. One

person without a guidebook commented that “When we're here I feel sooo lost without a Lonely Planet. I just feel stranded."

Maps are commonly used out of the guidebooks, but some travellers complained about destinations being “off the map.” They also had problems with text-based directions which had changed or were vague.

3.4.2.15 Recording experiences

A variety of different methods for recording experiences are used. One of the most common amongst the sample was sending group e-mails home (discussed further in a section below). Many people carried cameras to help relate experiences when they returned. Longer term backpackers talked of the difficulty of communicating travels to people who have not experienced it in person. They also discussed how travel changes the person doing it, and getting friends at home to understand that change can often be difficult. Journals are commonly used, but to varying levels. A few try to keep daily records, but most eventually write in them weekly or to describe important events. One girl wanted to take a video camera, but felt it would be too heavy to carry around. Another girl carried a scrapbook in addition to the diary for putting photographs and other information into. One person interviewed could be considered a ‘backpacking purist’ who does not take photographs and enjoys the fleeting nature of the experience and the memories as they are.

3.4.2.16 Use of communication media

E-mail is by far the most common type of communication (other than in-person speech) which backpackers use. It is extremely rare to find someone without an e-mail address. The cost of e-mail depends on the location. Some remote locations can be quite expensive. The couple who had been in Fiji said it was 50 cents per minute in some areas. Some travel outlets offer free internet with the purchase of a trip. One backpacker said “I have not written a letter in 5 years.”

It is becoming more common for travellers to use digital cameras, and even in remote locations it is possible to get pictures transferred from a camera to be burned on a CD. Phone calls are common for calling family at home and sometimes friends at home. Phone cards, or pre-paid mobile phone cards are frequently used for voice calls. In particular, if travellers have a partner at home, this may result in frequent phone calls or SMS traffic.

SMS is commonly used for rendezvousing in cities, amongst friends. Phone numbers do not appear to be as freely distributed, but are used for time-critical conversations and amongst travellers with stronger social bonds. E-mail is also used for rendezvousing, but probably on a longer-term scale. Travellers may take a few days (or more) to check e-mail, so SMS or voice calls may have to be used if the planned event is sooner.

3.4.2.17 Group e-mails

Several travellers discussed getting or sending group e-mails, both among people met on the road and with family or remote friends. One couple sent out group e-mails of their activities every three days, while another backpacker sent them out fortnightly. These group e-mails usually consist of accounts of places people have been and events that happened there. One backpacker indicated that he wrote one version for friends and an edited version for parents. He also mentioned that his male friends were happy to get carbon-copied on a group mail occasionally, while his female friends took offence at it and wanted personal accounts directly to them. Typically these messages are sent to around 10-30 people depending on the person. It is not uncommon to get group mailings from travel groups or activities after one has finished travelling with these people. One person said they liked this because “cc lists are important to find people from groups you like”.

3.4.2.18 Mobile phone activities

One informant had made extensive use of his mobile phone. He did not like using the Internet because there is “not always a computer available on the road" and he is “not so good at writing". He used the address book to store all of his contact information, and even kept some diary entries by saving SMSs without sending them. All of the people interviewed at the first hostel either currently had a mobile phone, or had one recently. One girl had her phone broken by someone else and was planning to get a new one. Another couple could not use their phone from the USA and had not purchased a new one.

Mobile phones are used for many activities while travelling. These include booking things, finding out about places, going to events, catching up with others and rendezvousing. The mobile address book is commonly used as a compact way of saving people’s contact information. The phones also serve as an emergency device. They are described as being “easier than a pay phone” to call people. SMS was commonly used among the sample, both for friends and family at home and with

people met travelling. "Text is just as good as conversation" said one traveller. One man we interviewed had an uncle in a small town without a mobile or landline phone. To send him a message he used his mobile to call a friend in the town, who then walked over to the uncle's house to deliver the message in person.

One traveller complained that coverage areas for pre-paid mobile phones were bad and that he was unable to use it on Stradbroke and Frasier islands. E-mail was perceived as being more stable than SMS messages, as some backpackers had deleted messages by accident or lost phones. It was also mentioned that SMS messages were less private as people could easily pick up the phone and read them. The address book feature gave one informant trouble because he had seven "Katrinas" in it and it was hard to differentiate between them.

One person had a camera-phone which he used for taking pictures as he travelled in stead of a stand-alone camera. He saved these to a memory card and uploaded them to a web site from Internet cafes. Mobile phones also seem to serve as company when travellers are alone. For example one traveller commented, "Sitting out here, there is nothing to do. I'd rather call people. My battery always runs out."

3.4.2.19 What they carry

Most backpackers carry one large bag and one smaller day bag which either straps on the outside of the large bag, or goes inside it. Travellers with cars have the flexibility to carry more. People living in a region for a longer period may collect more items, or bring less portable luggage such as hard suitcases. One informant who fit the definition of 'vagabond' more than the others simply carried a duffle bag with a few necessities. While not represented in this sample, I have met backpackers who travel with only a small day pack and keep all their essentials in it. When asked about this mode of travel, one experienced backpacker (who travelled with a large bag) said it was "not hygienic."

Figure 22: Collecting firewood for a camping trip.

Many of the backpackers had specific methods of packing their bags and a good idea of what items were important to them. A couple from the USA said they had heard so many accounts of other travellers sending unneeded items back from overseas that they had come with very little. Alternatively, some lamented items that were left behind. “We miss our music", said one person who left her CD player at home.

In general, backpackers carry a lot of miscellaneous items in two bags and on their person. One said, "I'm trying to think what I have, my whole top thing is stuffed with crap". Items such as clean underwear, a variety of shirts to look decent, and shoes for different occasions are important to some backpackers. Basic clothing to deal with the elements and provide comfort while on the move, such as rain coats, jumpers and socks are common items.

Guidebooks are frequently used, and cameras and phones are now very commonly carried. No one interviewed carried a laptop, and the size, weight and price of them may be prohibitive for backpackers even though some backpackers do carry them.

3.4.2.20 Miscellaneous

One backpacker mentioned that a constraint on community or friendship development is language ability. Some travellers have very poor language skills in the local language. English is the dominant international language for travellers, but it does not work everywhere. As a result, some people can appear to be extremely

introverted and then explode into social behaviour when they find someone from their home country who speaks the same language.

There was some anti-technology sentiment amongst the sample group. While not a trend, there were discussions with people who liked the accidental nature of meeting people without technological mediation. Some did not like recording experiences. They did however use some forms of technology while avoiding others.

Backpackers frequently have extensive future travel plans. One girl wanted to go to Bali, England, and Italy. Another person wanted to be a bartender in Jamaica for a while. Another couple was heading to Thailand after Australia. One member of this couple also mentioned that it was easy to continue finding new places to want to go to.

3.4.2.21 The hostelling environment

The following photographs are taken from a different hostel than where the interviews took place. It is larger, more organised and has a smaller percentage of long-term residents. These pictures depict a typical environment which backpackers live in for long periods of time, but in different hostels.

Figure 23: Beds in a shared room.

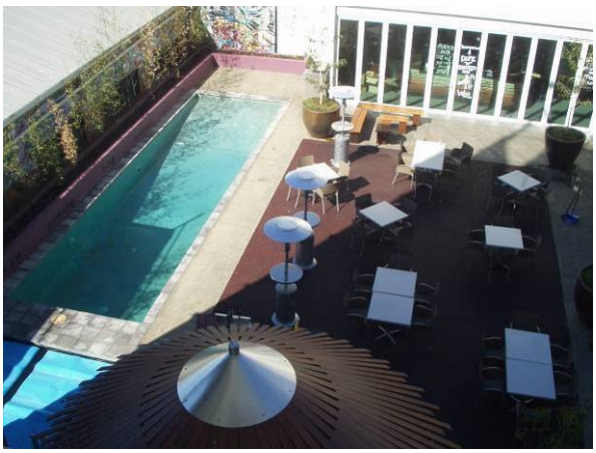


Figure 24: Pool and patio outside.

Figure 25: Rules for the hostel.

Figure 26: Lockers for storing items.

Figure 27: Washers in laundry area.

Figure 28: Behind the counter of the main desk.

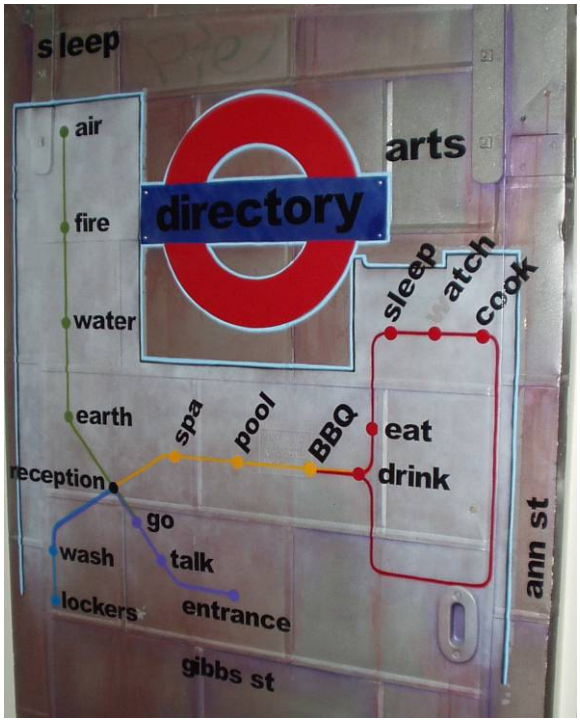


Figure 29: A decorative map of the hostel services.

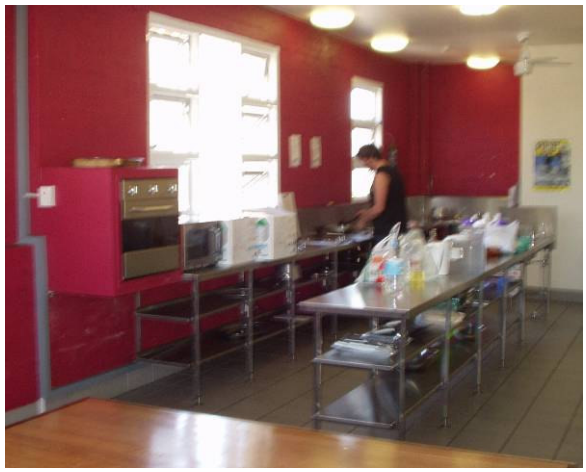


Figure 30: Shared kitchen space.

Figure 31: Desk for booking travel tickets.

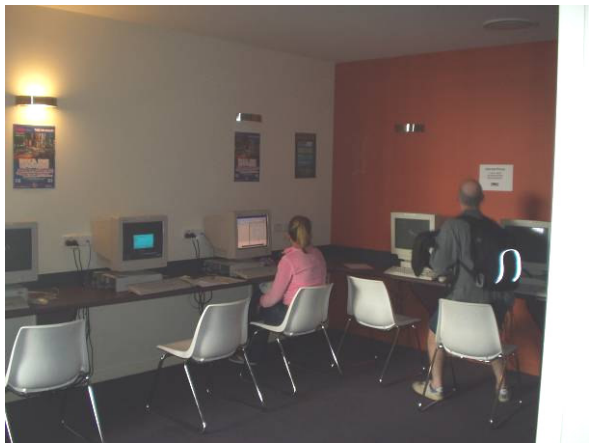


Figure 32: The Internet café in the hostel.

3.4.2.22 Discussion forums

Online discussion forums are of interest because there are a considerable number of people who talk about backpacking topics on them. They were included in the initial survey work to determine how Internet technologies might be affecting backpacking. One site which host forums on travel topics is Tribe.com. It has thousands of

members and a wide variety of conversation topics. Topics were collected from the following discussion forums (numbers show the number of posts):

- *Backpackers* (516),
- *Radical Travel* (600),
- *Who's That Broad Abroad* (204),
- *Tripping Backpackers* (375), and
- *Practical Nomad* (231).

These forums were chosen for analysis because they addressed topics related to backpacking and were sufficiently popular. The titles of each of the conversation threads were briefly reviewed and categorised. In some cases topics had unclear titles or discussions, which has resulted in the 'Miscellaneous / Unclear' category. The categories are ranked in order of popularity with the most common first (also see Figure 33):

1. Destinations general
2. Miscellaneous / Unclear
3. General travel advice / Stories
4. Equipment advice
5. Accommodation
6. Desire to meet up with people or company
7. Group / Specific activities
8. Particulars of location
9. Method of travel
10. Introductions / Greetings
11. Rent / Busy / Sell / Exchange

12. Discussion group specific

13. Work / Employment

14. Travel services

15. Budget related

The study did not specifically investigate why people are using the discussion forums for backpacking related discussion or where they are using them from. However, based on the common categories identified and a brief review of the content, it is likely they are used from a location where a person is living long-term, and often to plan travel activities for the future. Thus, forums may represent travel conversations that are not conducted while travelling, and possibly it may be locals interested in interacting with backpackers.

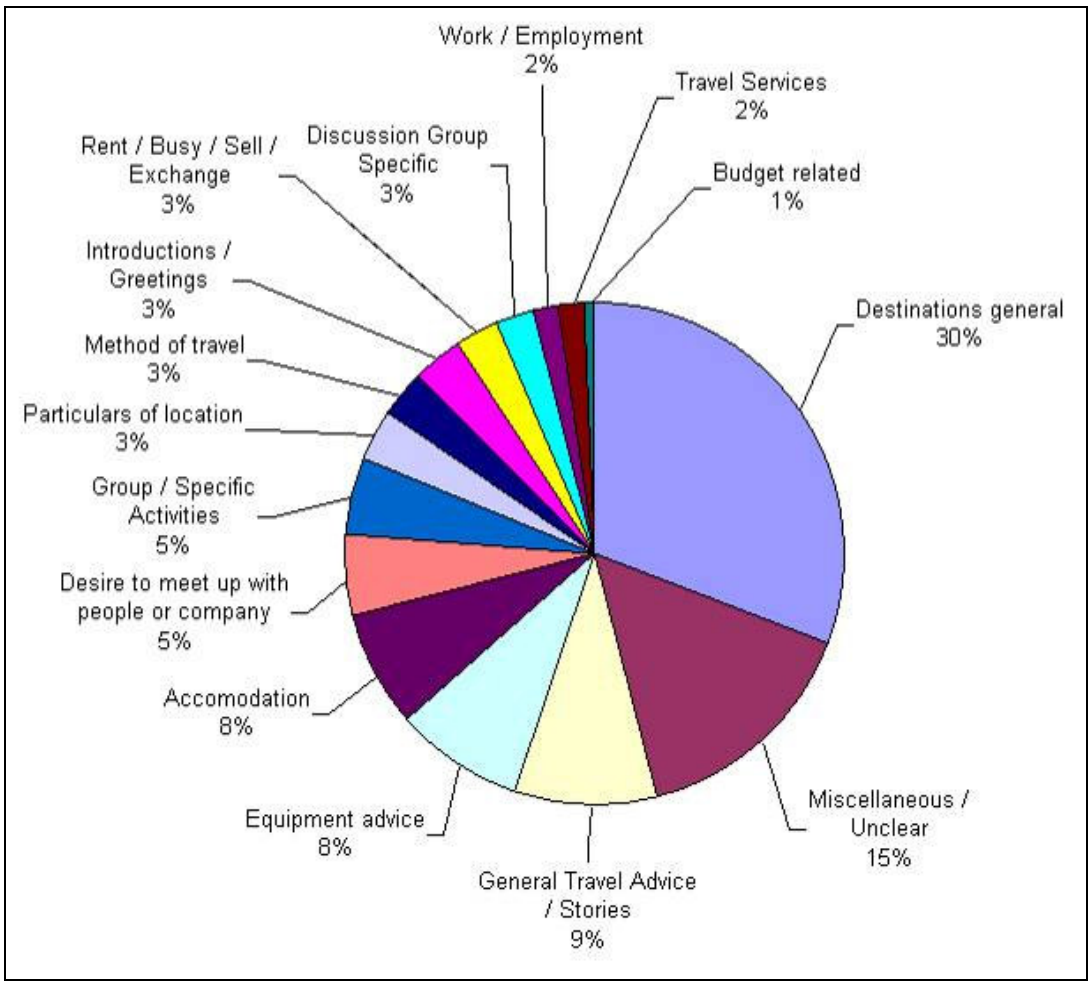


Figure 33: Categories of forum discussions.

The analysis and resulting graph (see Figure 33) shows that over half the conversation topics were about specific destinations (mostly that people were going to or had been to), general conversation topics, and those seeking general travel advice or telling stories to give advice. Less common topics included choosing equipment, finding accommodation, travellers looking for travel-partners, and more detailed questions. Work and employment, which are very common topics between backpackers while travelling ranks low here. Similarly, budget problems, arranging travel plans, and determining methods of travel are all common topics while on the road. This leads me to believe that forums are not heavily used by travellers currently on the road. This is also justified by the fact that interviewed travellers did not mention using these services during interviews (unlike travel blogging, which they commonly mentioned).

3.4.2.23 Social Networks

Backpackers who were interviewed frequently discussed their relationships to others in their lives. Their choice of communication medium often depended on which group they were contacting. The groups of people which backpackers contacted or came in contact with were fairly consistent and fell into the following categories:

- Travelling group,
- Current location group,
- Colleagues,
- Local friends,
- Hub location group,
- Friends met while travelling,
- Family, and
- Friends from home.

The exceptions related to whether the person worked while they travelled, travelled in a group, or stayed in one place for a long time. The diagram below shows a graphical representation of the social networks they discussed and tries to show how strong the ties are to different groups and how geographically distant they are.

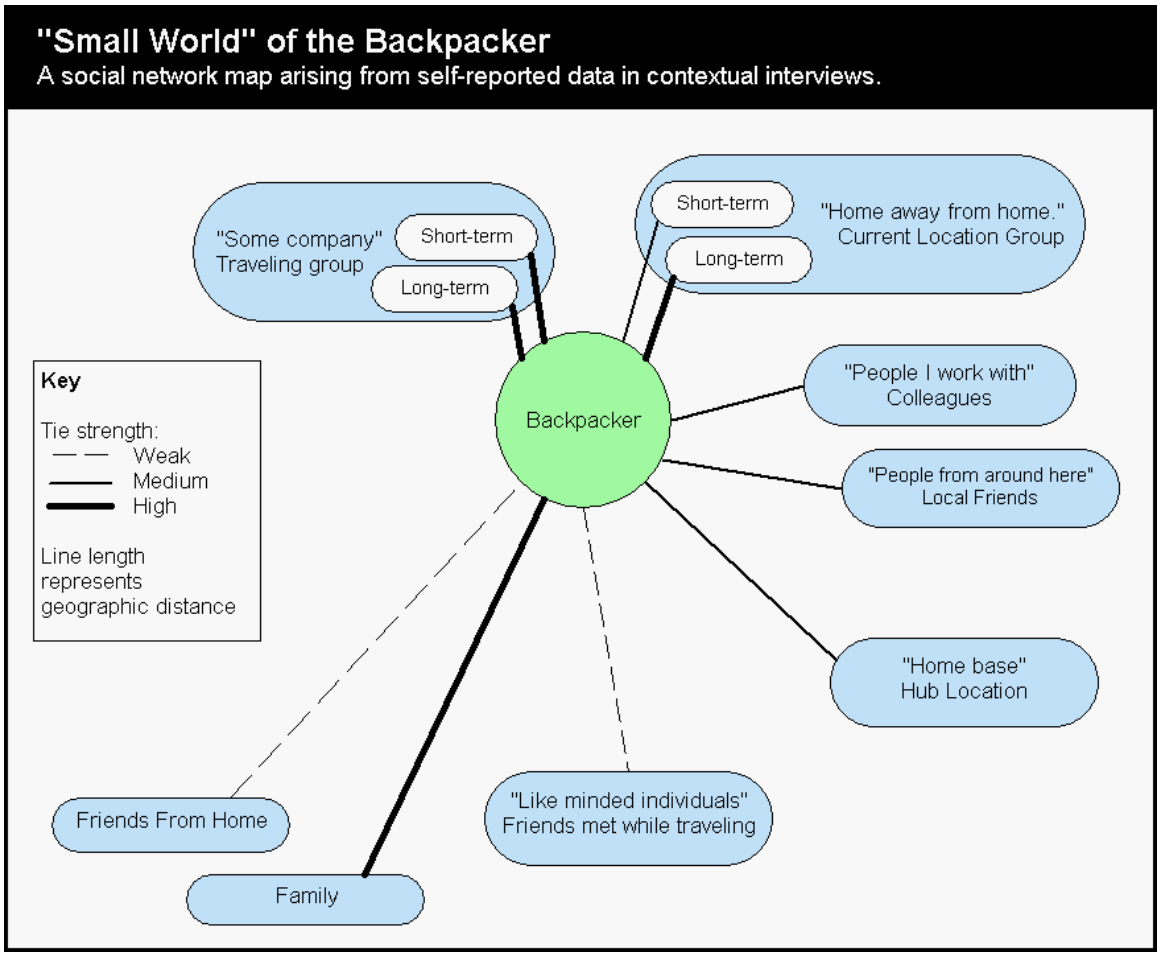


Figure 34: Conceptual diagram showing various social networks a backpacker is connected to.

3.4.2.24 Message boards in hostels

Paper-based message boards are commonly found in or outside hostels. They have a natural ‘archaeological tendency’ to bury older, non-relevant items. Postings easily fall into the categories of being posted 1) by backpackers or 2) by others seeking to communicate with them. Postings from locals are usually advertising for pubs and tourist activities, or employment opportunities for jobs such as nursing, telemarketing labouring, or hospitality. Hostels sometimes post information about transit services or low-cost events. Backpacker postings primarily concern: selling older cars or travelling gear, offers to share houses and transport, and people looking for items. Some cross-posting between hostels occurs, but postings by backpackers tend to be between people staying at the hostel where the board resides.

3.4.3 Discussion

This section briefly concludes with the topic of why relationships form between backpackers and design issues relevant to requirements generation for tourism technologies.

3.4.3.1 Why do family relationships form amongst backpackers?

Travel for long periods is a disruption in the normal lives of people who do it, and this distinguishes the people who do it from those who do not manage to. Based on a first impression, backpacking does not seem like something that is hard to do, and it would not appear to result in strong social bonds. However, travel may be much harder to do than it appears. Quitting a job, saving up money for a year or two, having the motivation to go, getting visas, and not cancelling your plans at the last moment because of a new boyfriend/girlfriend are significant hurdles. These issues, combined with the actual travel experience of surviving new cultures, keeping track of possessions and coping with constant change makes for a very rich experience. Backpackers have to rely on each other to survive, and they represent a small subset of the population simply by making it to where they are. It may be due to these fairly extreme circumstances that backpackers report such strong bonds forming with others in such short periods of time.

3.4.3.2 Issues for design

Please see Appendix A.1 for a list of design issues.

3.4.4 Summary

A series of ethnographic and participatory inquiries into backpacker culture have been conducted as part of a thesis investigation into research methods and mobile technology requirements for this mobile community. The results indicate that backpackers operate in social, ad-hoc, travelling groups which tend to lack an effective communication medium to support material and informational exchange. Backpackers currently practice community authoring in oral form through storytelling, giving advice, and display. Their networking can often be described as both offline and peer-to-peer. This has justified primarily exploring decentralised structures for candidate technological approaches to support backpacker networking. These studies further suggest the need to share negative as well as positive feedback about experiences in an uncensored format. I have also observed the social nature of

backpacker culture and intend to promote face to face interaction with further designs.

3.5 Research Study: Mobile Information Sharing (MIS) Study

The previous study sought to understand the design space at a high level and explore broad cultural issues. It also concentrated on self-reported accounts of travel. Another study was needed to complement this perspective with actual observations of travel behaviour and to investigate how mobile groups functioned. I was also interested to see how contextual factors would affect group usage of mobile tourism technologies. To investigate this, I conducted a study of mobile information sharing and social network formation amongst backpackers engaged in a typical tourist activity. The study is named 'Mobile Information Sharing' (MIS), with iterations 1 and 2, which were conducted several months apart. The method for both iterations of the study were very similar; MIS-2 differed in that it introduced mobile prototypes during the field trip, a design debriefing after returning to the hostel, and use of a third observer.

For reasons of brevity, the method and results of both iterations are described together, and differences are highlighted when necessary. The section begins with a description of the method used. The results section begins with a description of the participants, stages of the 'field trip', interpersonal bonding, and technology usage. This is followed by discussions of different environmental factors such as the type of mobility and the impact of stable environments on group behaviour. Other topics such as missed opportunities for information exchange, formation of trust, and problems experienced by the backpackers are also discussed. The remainder of the section discusses the in-situ review of the seven mobile tourism prototypes, requirements discussions with backpackers, and resulting design ideas.

3.5.1 Method

A group of six backpackers (seven in MIS-2) were recruited from a hostel for the study. They participated in a day-long activity including two workshops, a boat cruise and an animal park visit in Brisbane, Australia. The 'field trip' (the portion of the study outside the hostel) consisted of three distinct types of mobility: 1) walking to a destination, 2) using group transportation, and 3) walking around a location. While signing up participants several days prior to the study, hostel staff distributed a

questionnaire concerning the participants' recent travel history, future travel plans and any travel-related questions they had. No attempt was made to restrict the participant demographic, other than to ensure they were travelling and not long-term residents. Backpackers typically stay two to three nights in Brisbane and most had arrived just prior to the study (South Australian Tourism Commission, 2004, personal communication with hostel manager). Participants were compensated by receiving the trip for free (value $45 AUS). Walking in the city, the boat cruise, and park visit are inexpensive and common activities for backpackers and other tourists.

In MIS-1 the backpackers were accompanied by two researchers for most of the activity outside the hostel. Due to the distributed nature of portions of the field trip, some participants were not continuously observed. One researcher conducted discussions and took notes; a second researcher recorded video throughout the day; a third researcher prepared forms at the hostel and assisted in the final workshop. Two backpackers who volunteered wore digital audio recorders throughout the day, primarily recording their own speech and those they talked with. The recorders required no interaction by participants and were not easily recognisable to others. All participants knew audio and video recorders were used, and those carrying audio recorders could turn them off or muffle them if needed for privacy reasons. In MIS-2 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. As a consequence of previous results in MIS-1, participants were queried about pre-existing relationships, and one recorder was distributed to each pre-existing group to maximise recording coverage.

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

In MIS-2, the primary change in the study structure was to introduce mobile tourism prototypes into the day's activity. The prototypes are briefly covered here before the remainder of the methods are discussed.

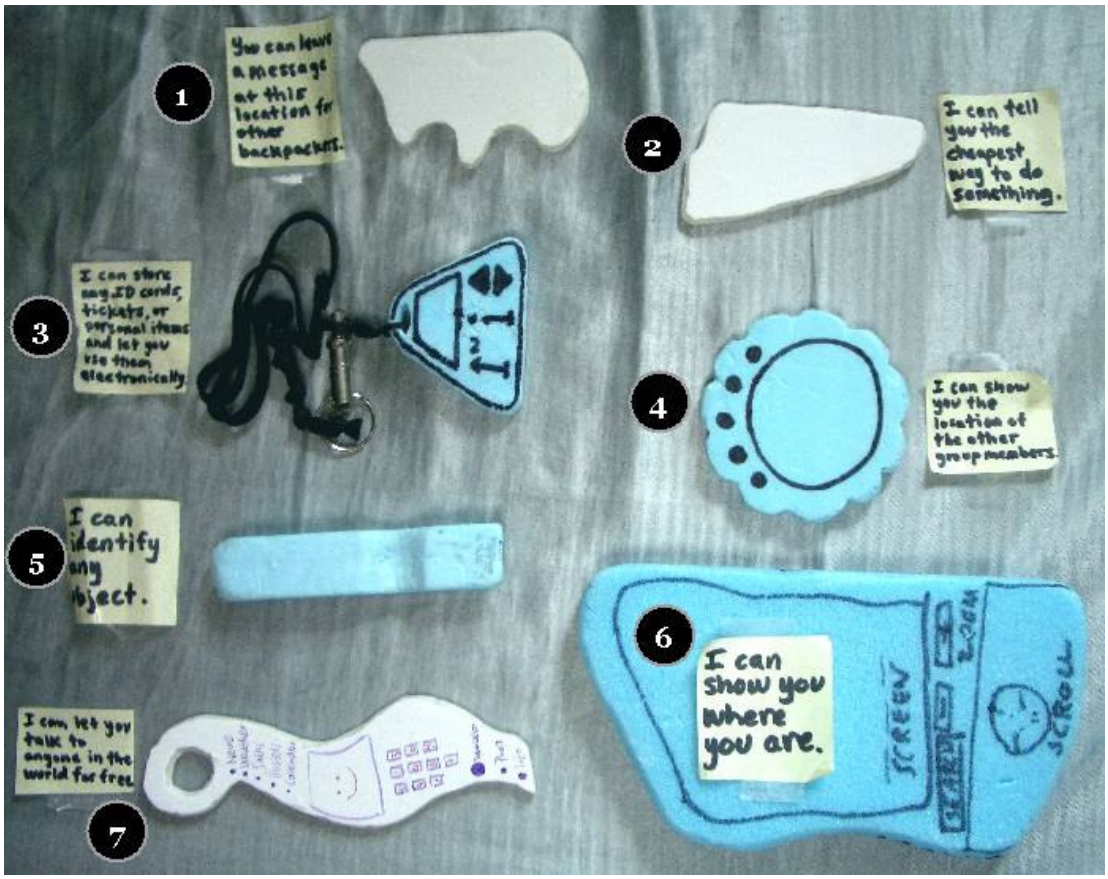


Figure 35: Prototypes chosen by participants for use during the study. The drawings on the foam were made by participants during the study.

The seven participants were each asked to choose one mobile device prototype from twelve available options. It was expected that this would give participants more power to influence resulting designs and find functionality which was relevant to them. The prototypes that were chosen are shown in Figure 35. Those that were not chosen are described in more detail at the end of the results section (see Section 3.5.2). The fictional functions for all of the prototypes were as follows (those not chosen are listed last):

1. “You can leave a message at this location for other backpackers.”
2. “I can tell you the cheapest way to do something.”
3. “I can store any ID cards, tickets, or personal items and let you use them electronically.”
4. “I can show you the location of other group members.”
5. “I can identify any object.”
6. “You can talk to the group using this device. I can show you where you are.”
7. “I can let you talk to anyone in the world for free.”

- “I can find any object for you.”
- “I can find someone who wants to buy something you have.”
- “I can tell people whom you choose what you are doing now.”
- “I can tell you what other backpackers thought about something.”
- “Ask me where to find people who know about something.”

Each prototype was a piece of lightweight foam with an attached sticky-note describing one of these fictional functions. 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. A researcher demonstrated marking up a sample prototype with a pen and each participant was given a permanent marker to draw with. A researcher 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 influencing 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 and the

occasional necessity of playing ‘tour guide’ (e.g. for directions to the boat). 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 I wanted them to envision usage of a future product without dwelling on the technology used.

I was primarily interested in what situations provoked usage of the devices and what requirements they had for it. To this end it was not suggested exactly how the prototypes should be used. It was hoped that the unpredictable environment and personal characteristics of the backpackers would challenge the researchers with new proposed functions and situations. There is a subtle balance in the design of exploratory user 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 (Houde & Hill, 1997). However, providing too much detail reduces 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.

Two researchers (three in MIS-2) walked with the group of backpackers from the hostel, through the city centre and shopping mall, to the boat dock. The researchers did ask questions to clarify issues or to request elaboration on interesting topics introduced by the backpackers, which is consistent with participant observer protocols (Lofland & Lofland, 1995). The boat cruise lasts approximately 1.5 hours and drops off passengers at the animal park. The backpackers were given their own tickets to the park and were free to do what they wished during their 2 hours there. They reboarded the boat after the park visit, for the return cruise back to Brisbane city. Upon docking they walked approximately the same route back to the hostel.

This was followed by an hour discussion and user centred design activity run in the hostel by three researchers. Immediately upon returning, the backpackers completed a new questionnaire which used answers from the previous questionnaire, pertaining to future travel locations and questions. They were asked if these topics had been discussed during the day’s tourist activity. In MIS-1 video from the day was then used

to prompt discussion about information sharing on the trip. Backpackers reflected on what they talked about, group formations throughout the day and general travel issues. In MIS-2 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. A pilot of the prototype presentation activity had previously been conducted with ten postgraduate HCI students and lecturers in which the protocol for the exercise was refined.

3.5.2 Results

This section first introduces the participants in some detail because of the qualitative, small-group, nature of the study. This is followed by a detailed review of the phases of the field trip, and results pertaining to mobile information sharing and group behaviour. Several themes are explored after this including technology usage, types of mobility, and effects of the environment on the backpackers. After this are several sections pertaining to social issues: missed opportunities for exchanging travel tips, and trust, fun and enjoyment while travelling. The next section addresses problems and difficulties backpackers experienced, and their implications for design. The remainder of the section is devoted to a detailed discussion of the prototypes: how they were used, what did and did not work well, and requirements that were generated by using them.

3.5.2.1 Participants

All of the participants in both study iterations were backpackers (BP), and are referred to as BP#(S), where # is their assigned identification number; if it is ambiguous, ‘S’ indicates the study iteration 1 or 2 (e.g. BP7(2)). Similarly, both iterations happened to have three subgroups (A,B,C) which have the iteration number following them (e.g. subgroup A(1)).

In MIS-1 the participants formed three pre-existing subgroups (see Figure 36):

Subgroup A(1): BP1 and BP2 were married, from Ireland and Holland, and in their mid-thirties. They were travelling for seven weeks with a moderate budget.

Subgroup B(1): BP3 and BP6 were friends from England in their late teens. They had recently spent a month in New Zealand and were spending several weeks in Australia on money borrowed from parents and credit cards.

Subgroup C(1): BP4 and BP5 were acquaintances from the day before. BP4 was from Holland and in her late teens, working while travelling, and on a very tight budget. BP5 was from Korea and in his early twenties and was travelling off a reasonable amount of savings.

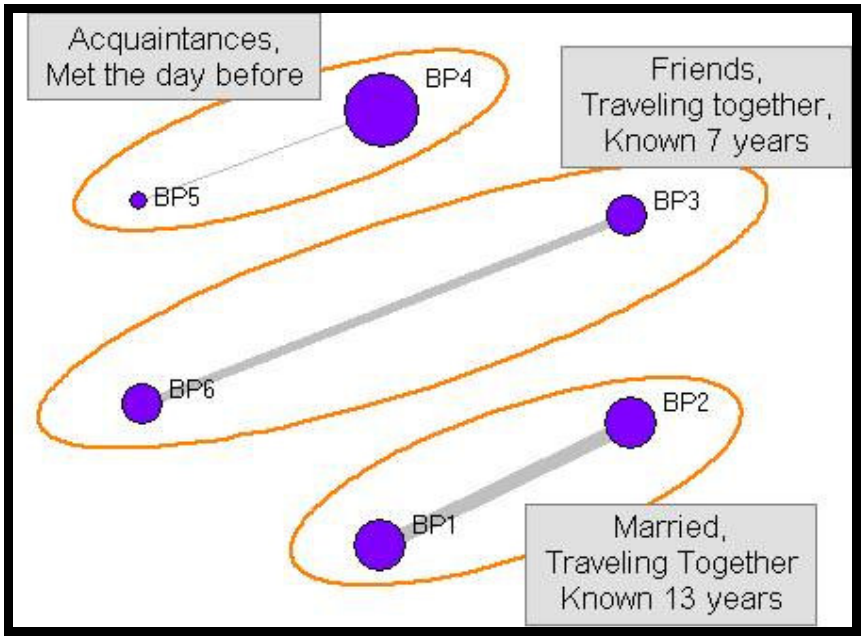


Figure 36: Travel history of participants in MIS-1. Line width indicates duration travelling with partners. Circle size indicates travel experience this trip for an individual.

In MIS-2, there were seven participants, which also happened to form three pre-existing subgroups (see Figure 37).

Subgroup A(2): 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(2): 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(2): 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.

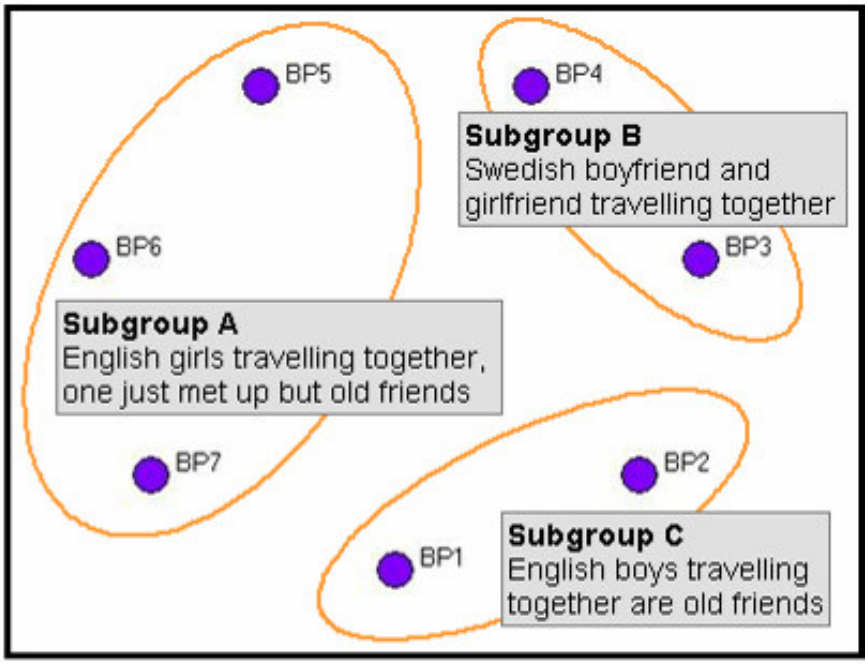


Figure 37: Participants in MIS-2 formed three pre-existing subgroups: three female friends, a couple and two male friends.

3.5.2.2 Stages of the Field Trip

The following sections provide an on-the-ground perspective of the stages of the field trip (in both study iterations): leaving the hostel, walking to the boat, waiting for the boat to start, the boat trip to the park, walking around the animal park, the boat back to the city, and the return walk to the hostel. The corresponding environmental and behavioural changes are also described. This level of detail is provided for several reasons: it qualitatively defines the context of a mobile group of backpackers, it contrasts different types of mobility, and it shows detailed examples of existing behaviour which new mobile devices would need to integrate with.

Figure 38 **Figure 39**

The walk from the hostel to the boat and back went through the middle of the Queen Street Mall in Brisbane, across streets and a set of stairs to the boat dock.

Walk To Boat

Participants left the hostel and walked for 20 minutes through the outdoor city mall to the boat (see

Figure 38). Traffic noise, pedestrians, street lights, sidewalks, walking and a stairway were factors in communication during this period, but did not greatly diminish it. Participants mostly walked in pairs, or in cases of larger spaces in the mall, sometimes in a row of four (see Figure 39). Consequently many conversations were done in pairs, either between strangers or between travelling partners. Conversational topics were similar to those in the previous group setting, but often in more detail. Topics included past travel experiences, details about home cities, cultural issues about home countries, and future travel plans. These common conversational openings were also mentioned by backpackers in interviews (see Appendix A.1) and are addressed below in Section 3.5.2.7. An ATM was requested by BP4(1) and was visited briefly, resulting in the other backpackers briefly forming a group nearby. Group behaviour commonly changed based on the needs of specific participants in an unpredictable fashion. Participants got ahead of the researchers at one point and asked which way to go. They were directed to walk down the mall until

the end. Most of the backpackers were not yet familiar with the layout of the city, although BP4(1) had been working there a month and knew some of it. Also, subgroup A(2) had arrived the day before and had already spent time in the mall. They had discovered a stand selling yoghurt which they wanted to go to for breakfast. The entire group paused outside the stand while ordering was completed. The girls shared their yoghurts amongst themselves, with Observer 1 and with subgroup C(2). They indicated that they "*really liked it*" and they visited the stand again later in the day. This demonstrates how early experiences can shape evolving goals and future behaviour.

Subgroup A(2) 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(2) 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 does not serve as a good landmark. Subgroup B(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."* Thus, as this example illustrates, utilitarian situations encountered by chance during the study resulted in proposals for mobile device functionality.

Waiting on Boat

The participants arrived at the boat early. They initially waited in line and then chose seats on the upper deck of the boat. The seats were locked together in pairs and could partially be relocated (see Figure 40). Seating matched the pre-existing social ties of the participants (e.g. the married couple sat together).

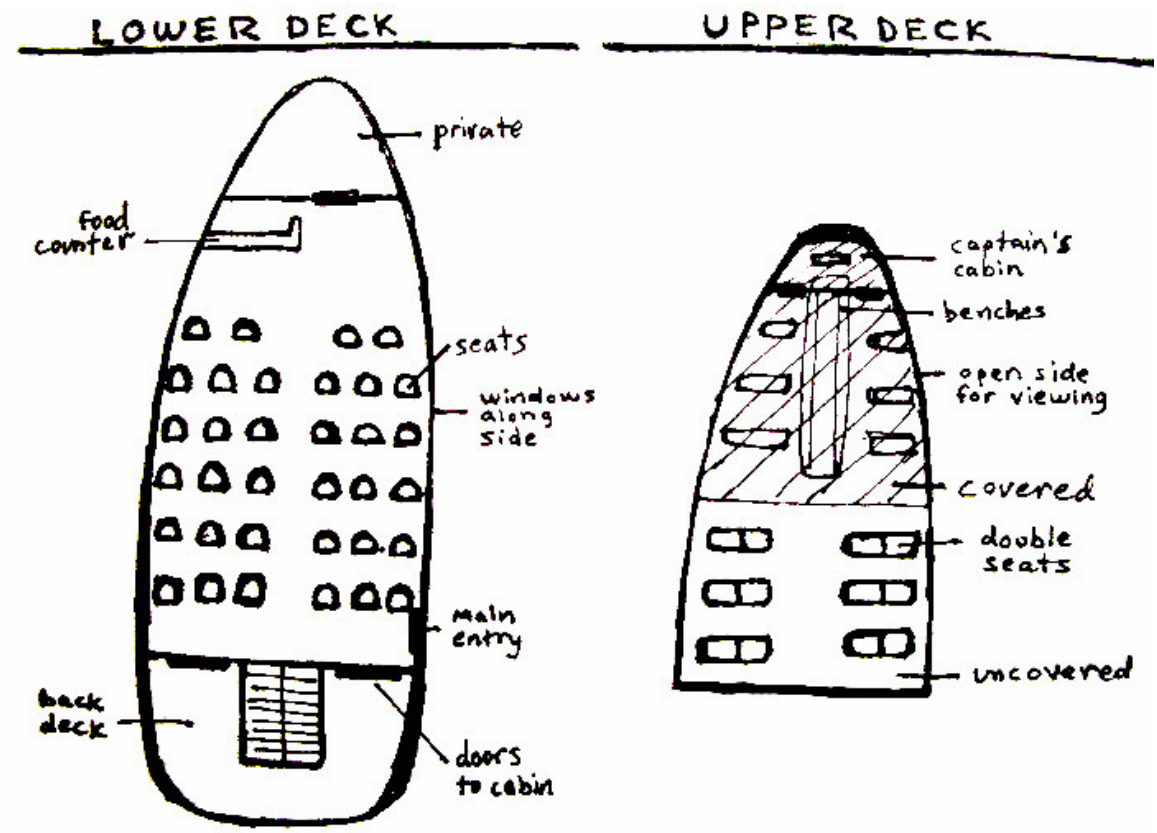


Figure 40: Lower and upper decks of the cruise boat, showing available seating, doorways, covered regions and stairs leading from lower to upper deck.

In MIS-1 subgroup C was initially less sociable than the other members of the group; both walked together and sat together throughout the boat journey. The other two subgroups moved one of the boat seats so as to sit facing each other during their active conversation. Subgroup C sat across a small walkway and traffic noise made it difficult for them to hear or face the other two pairs.

In MIS-2, 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. BP7 texted a friend back in England and subgroup A shared photographs 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." BP7 and her friends had met a group of male travellers in a previous city, who also knew the girl who passed on this travel information. BP7 had arranged to meet the girl through the male travellers in a different city later. This demonstrates the ad-hoc nature of meetings and information exchange between backpackers on the road. Other discussions included: cultural differences, products available in different countries and recent travel locations and activities.

Boat To Park

The boat filled up with other passengers who sat near the participants and interacted with them to a limited degree. A short time into the boat trip in MIS-1, it began to rain. This resulted in comments from BP1 who had expensive camera equipment, and an exodus of passengers from the uncovered portion of the upper deck. Subgroup A(1)&B(1) moved into the covered area on the deck, sitting on a long bench in a row. Subgroup C went down the cabin and sat in chairs near a window for the duration of the trip. This is an example of how environmental factors can significantly impact group behaviour and socialisation opportunities.

Shortly after the boat started a recorded sequence of announcements discussing visible objects, history of the area and tourist information began and continued for the duration of the trip. The announcements had a large impact on resulting conversation by the backpackers. Talking over the announcements was possible, but required concentration. Topics in the announcements often served as new topics of conversation for the backpackers, and sometimes prematurely ended previous conversations. One instance related to Brisbane hospitals as shown in the following quote.

> *Intercom: Now if you look on the right side of the river, through the trees, you can see a large brick building with a teal blue coloured roof. That is the Wesley Hospital. It is one of the most modern hospitals in Australia. [Further discussion about a building omitted.]*
>
> *BP4(1): If you have to go to the hospital, you should do it in Brisbane.*
>
> *Observer 1: Why's that?*
>
> *BP4: Cus it is the new and fancy one.*
>
> *Observer 1: It is not a very dangerous city, I do not think you stand a very good chance of going there.*

> *BP4: A friend of mine has already been there. He does labour work and he got chemical dust in his eyes.*

In addition to the prompting of topics, this discussion demonstrates the type of work backpackers can become involved in and the grey region between backpacker and itinerant worker. Other examples of conversations that began in this way included the topics of common trees in Australia, and breweries. An additional source of conversational prompting was the ever-changing scenery. Bats, houses, and the University were some of the visible objects which independently sparked conversation. The trip lasted an hour and the boat proceeded slowly along the twisting Brisbane River, passing a bat colony, bridges and houses. BP4 used SMS to chat with friends during this period and listened to her iPod in one ear while holding conversations with others. This shows the level of multitasking which mobile devices enable backpackers to do, and the level of distraction mobile device designers should expect users to be experiencing.

In MIS-2, 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 did not talk much during the boat journey. This shows how physically proximate subgroups can remain isolated (i.e. cliquishness) and how environmental factors encourage certain group behaviours, but rarely dictate it.

Animal Park

The animal park visited in the study is the Lone-Pine Koala Sanctuary. It houses a large number of koalas, kangaroos, wallabies, birds and other native animals. It spans 50 acres and has winding paths and multiple exhibits including a large field of animals with multiple gates into it (see Figure 41).

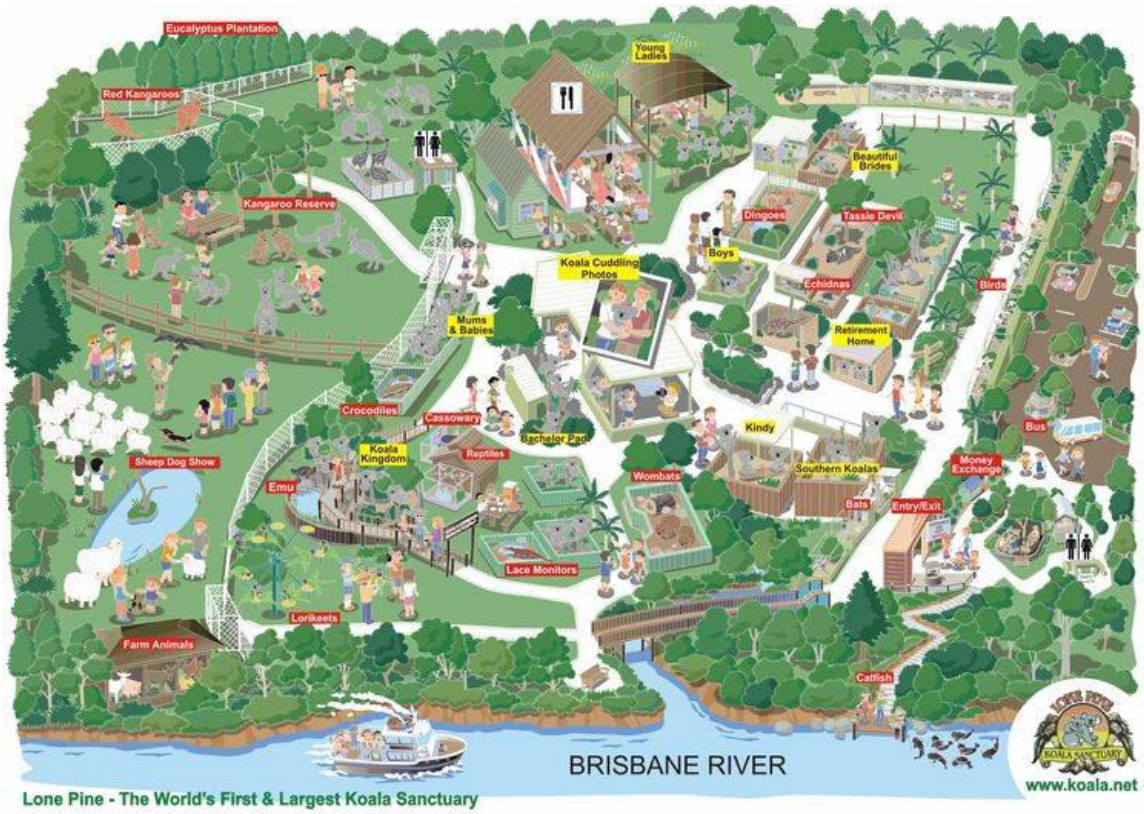


Figure 41: Full map of Lone-Pine Koala Sanctuary which participants walked around.

Upon arriving, the participants walked up a path and stood in line for entry. Upon entering they began a planning stage where they discussed what they wanted to do using maps and flyers, and factored in the time available before the boat left. BP4(1) received a phone call from Holland but it ended when her battery died. The participants asked questions of several park staff concerning the animals. Conversations concerned types of animals, how to operate cameras and cost of various activities in the park. All six participants in MIS-1 ended up in line for taking a picture with Koalas. This was apparently not by consensus, as they arrived a few minutes apart. This is one small example of the frequency of chance encounters while travelling. Cost issues delayed subgroup B(1)'s decision and subgroup C(2) who had already left to view reptiles and arrived later. After photographs, all groups briefly entered a shop to buy animal food and look at their photographs. Upon leaving they saw a koala talk had started and ran to join it. This is an example of unforseen opportunities which backpackers are quick to take advantage of.

Conversations during this period tended to focus on the objects seen in the environment such as cameras and kangaroos. For subgroup A(1) there was

noticeably less conversation when at the park on their own. Subgroup B continued to chat and discuss what they were seeing and eventually went to a kiosk for food. The lunch area provided a stable environment and a table, which subgroup B sat at facing one another. Conversational topics during this period tended to be more reflective and disassociated with currently visible objects. For example, one conversation related to plans for the next few days, and locations near the hostel in the city. Other topics included past and future employment, and intentions to see other portions of the park. This demonstrates how stable environments which have fewer distractions and require less monitoring allow opportunities for more abstract or time-shifted topics.

While in the kangaroo reserve subgroups A(2) and C(2) briefly interacted to watch a joey in the mother's pouch and to have subgroup C take pictures for subgroup A. 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 also look at them as they passed by going the other way. These examples show how environmental factors and location of other group members can change development and exchange of knowledge capital within the group, and resulting behaviour.

The majority of the discussion while walking at the park revolved around animals that were seen, and navigational or immediate planning issues. Questions arose about various animals. For example, one sign with an unfamiliar name prompted the following question to an observer, "*Do you know what pademelons are? Is it a collective word for all types of kangaroos and wallabies?"* Sometimes information signs were not proximal to the current location, the glare on windows made it difficult to see into cages, and animals were often hiding or sleeping. The backpackers also discussed shopping options, wondering about prices at different locations. "*It might be a lot cheaper to get Laura a [toy] koala at the souvenir shop [outside the park] then to get it from here.*" This demonstrates how knowledge available to residents might be useful to backpackers and how educated guesses are made to guide decisions. Participants in both study iterations split up into subgroups rapidly and maintained them throughout the park visit with the exception of occasional chance encounters.

Boat To City

The return trip on the boat was similar to the initial trip with two exceptions. Firstly, the intercom was not used to broadcast tourist information, with the exception of announcing the bat colony and a photo opportunity for the cityscape. Secondly, the group members knew more about each other and had the opportunity to sit in one group in pleasant weather. Conversation rates were higher, at louder volume and more animated on the return journey. An initial group discussion focused on the quality and cost of the koala photographs which most members of the group had purchased. Other conversation topics included: places they had travelled to, job opportunities, the cost of travelling to different locations and advice about future locations. The latter typically comes in the form of a story which incorporates first or second-hand information in an entertaining fashion, such as the following quote.

> *BP1: In the North of New Zealand, there is a place called 90 mile beach. And you can actually drive on it. You can drive all the way, 90 miles on it. It is actually that length. They say you can not do it with a normal car, you'd need a 4x4. But we heard stories about people doing it in a normal car. Even with a 4x4, at one place there is quicksand. You know? So if you do not know, and you drive into it, the car just goes... and some people get stuck. And apparently it rips out the entire car. The sea, you know, it comes in and...*

In MIS-2, 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 42).
Subgroup A(2) 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 photographs (see Figure 42), 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. Thus an environment which had facilitated extensive intra-group socialisation in MIS-1 also facilitated isolated subgroups in MIS-2.

Figure 42 : Subgroup A (front) sits away from subgroup B (back), while both privately review photos.

Figure 43: Subgroup A stops to buy postcards as they had planned to do while on the boat.

Walk To Hostel

The return walk to the hostel used a slightly different path, and participants were more familiar with the area from the morning walk. Additionally, in the afternoon the mall becomes extremely busy with large crowds, musicians, and shoppers. Participants stopped to watch a street artist and talked mostly in pairs while walking through groups of shoppers. Subgroup C(1) got ahead and separately made their way back to the hostel. Subgroups A(1) and B(1) (and both observers) went to a juice shop and took a different route back to the hostel. Participants had to move between heavy crowds of people. Conversations occurred while they waited in line to order and receive drinks. This is another example of stable environments facilitating conversations about topics unrelated to the immediate environment. Other topics included: methods of mailing unused items home, discount offers at shops, use of travel diaries and what it is to be a backpacker.

> *BP4: This is the first time on my own. And I came here with no plans at all. It was the coolest thing ever. I arrived at Sydney at 8:15 in the morning and I did not have a hostel for the same night. I did not have plans where to go. It was really cool. Ya we can cross [crosswalk]. And I feel so free when I'm travelling. I do not have any worries at all. I do not have to pay my rent, and pay this or that.*

This conversation, which was discussed while walking, describes the tendency to avoid advance planning and to enjoy the disconnection and freedom from the responsibilities of typical society or daily habits while travelling.

Subgroup A(2) ran 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 43). They were informed by the clerk that they did not have stamps, but that they were available from a newsagent nearby. They then split up; BP6(2) went to exchange traveller's cheques and BP5,7 went to buy yoghurt at the same shop they had visited in the morning. This shows how multiple goals are balanced, and unexpected obstacles are integrated and plans reformulated on the fly. After regrouping, they stopped at the newsagent to buy stamps for the postcards, and 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. This demonstrates maintenance of social networks, the social impact of various communication technologies, and the complexities of using them. The other subgroups headed directly back to the hostel and had to wait for the last group and observer to arrive.

3.5.2.3 Group Information Sharing and Interpersonal Bonding

The study participants had pre-existing social pairings and separated into subgroups during many parts of the field trip. The various stages of the field trip described above did affect communication behaviour. Situational issues such as available seating, intercom announcements and changing environments constrained or encouraged types of discussion. Familiarity and the shared experience of the park tour increased conversation levels on the ride back in MIS-1, but not in MIS-2. Many cases of collaboration and sharing between backpackers were noted (see Section 3.5.2.9, and related Sections 3.4.2.2, 3.4.2.4, 3.4.2.5). While qualitative observation of communication levels and developing relationships was invaluable, it is also useful to see how the participants perceived their own relationships. 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 by the NetDraw software to automatically weight line widths.

Figure 44 and Figure 45 show the change in self-reported communication frequency before and after the activity in MIS-1. After a full day of talking with each other, the communication rates were reported to be higher. Some participants did not talk to other participants much, as depicted by the thinner lines in the 'after activity' graph on the right. Several strong pairings developed (e.g. between BP4 and BP6, BP1, BP2) showing significant conversation between strangers. This also clearly shows the impact on group communications and the extroverted nature of BP4.

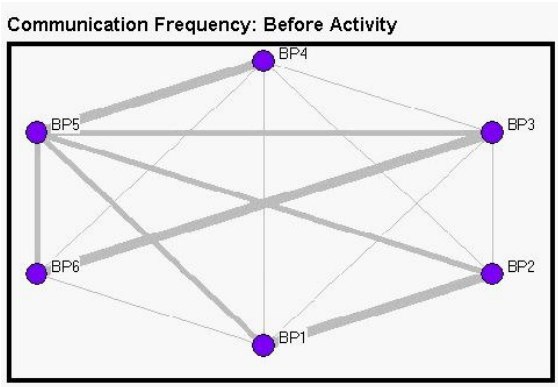


Figure 44: MIS-1 Before. Perceived communication frequency between group members primarily occurs between existing subgroup members..

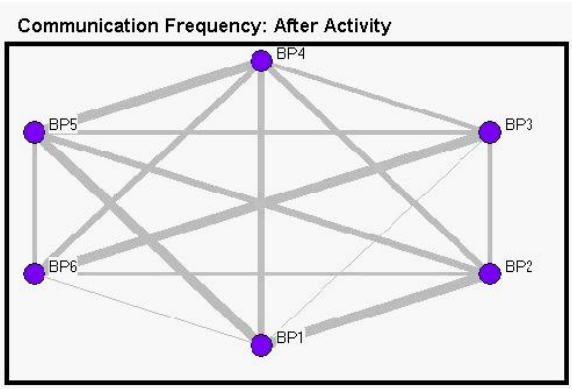
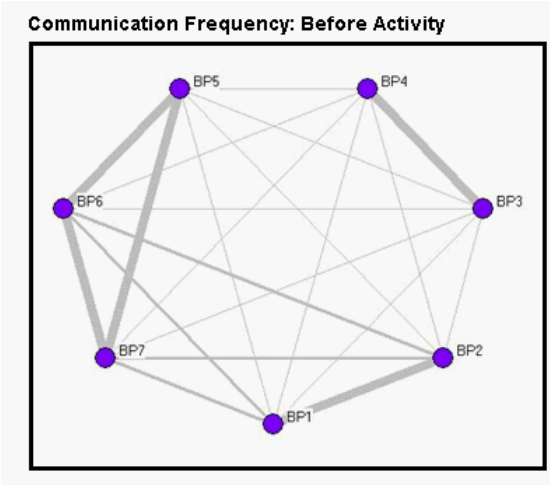


Figure 45: MIS-1 After. Considerably more inter-subgroup communication is noted, with several pairs communicating very little (BP1-BP6 & BP1-BP3).

In MIS-2, the participants spent most of the day walking or sitting near other subgroup members, and primarily talking only with those people. 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 between subgroups. Subgroups A(2) and C(2) also had short discussions while taking photographs 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 46). After the full day of activities, these connections had only developed slightly, and subgroup B (BP3, BP4) had similar external ties to when they started (See Figure 47).



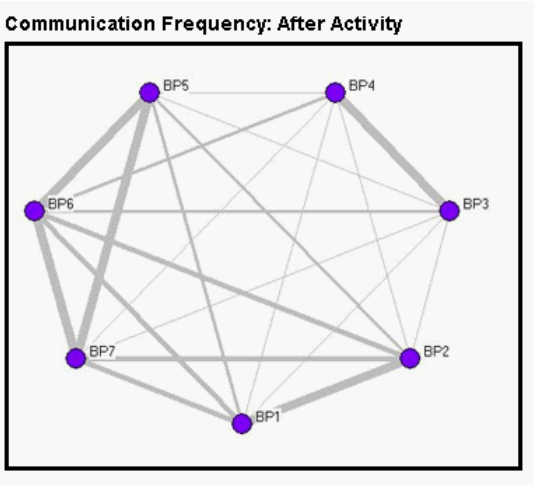
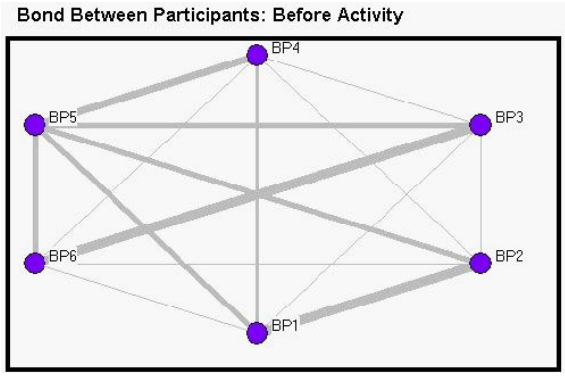


Figure 46: MIS-2 Before. Similarly to MIS-1 the graph shows communicating within existing subgroups.

Figure 47: MIS-2 After. Considerably less communication than in MIS-1 and subgroups remain reasonably isolated.

The low communication levels may have played a role in fairly weak interpersonal bond formations during the day, although shared experiences can also influence bonding (Daly, 2004; Yarnal, 2004). Pre-existing bonds between long term friends can be clearly seen (see Figure 48), but some of the backpackers never formed stronger bonds with other members of the group. These are similar to the communication rates. People who talked more with each other tended to feel more of a bond with each other (with the exception of BP3 & BP4).



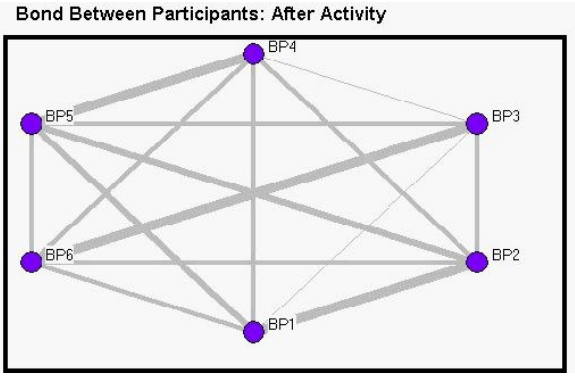


Figure 48: MIS-1 Before. Social bonds between subgroup members are shown by thick lines at the beginning of the study.

Figure 49: MIS-1 After. Some strengthening of bonds. BP1 & BP3 did not communicate much (see Figure 45) and also did not have a strong bond form. BP3 & BP4 did talk, but did not bond.

In MIS-2, the backpackers had many opportunities for discussion, but little in the way of bridging interpersonal bond ties developed. Paradoxically BP2(2) commented that there had not been enough opportunities to talk to others.

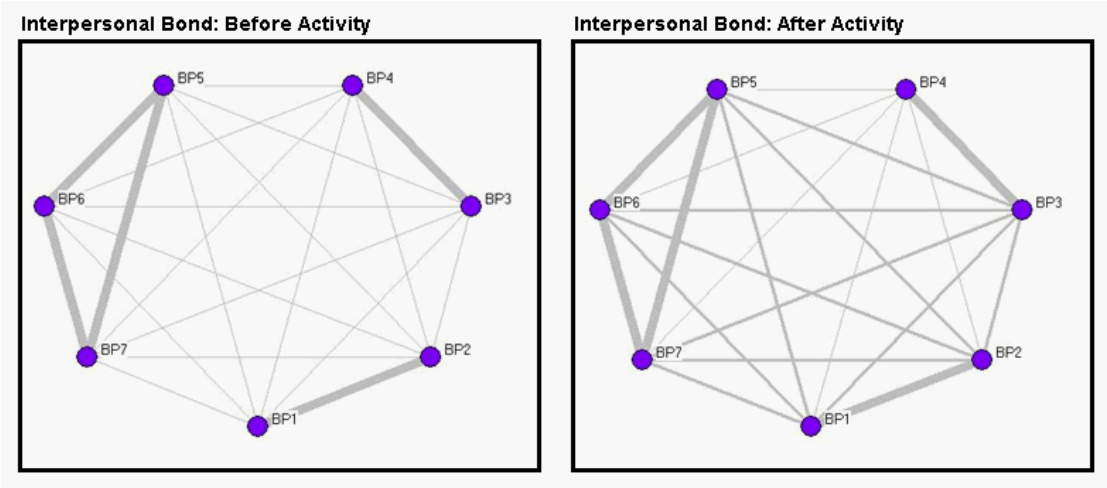


Figure 50: MIS-2 Before. Reported interpersonal bond before clearly show strong pre-existing relationships.

Figure 51: MIS-2 After. Group bonds did not increase strength as much as in MIS-1 and BP4 feels little connection to the entire group.

Each subgroup had an observer with them at all times, which could have affected participants' willingness to strike up conversations with others. Other 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, which may have been a factor in interacting less with others.

3.5.2.4 Technology Usage

A wide variety of technologies of both the standard and electronic varieties were discussed and displayed. 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.

Non-electronic objects included water bottles, rain jackets, shoes, backpacks, camera cases, tickets, maps, sunglasses, keys, ID cards, sleeping bags, money and other items. These are often used in conjunction with electronic objects (e.g. camera bags or jacket pockets for music players). 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 also frequently 'juggled' by travellers, putting important objects in safe locations while handing unimportant objects to others or setting them on the floor.

Electronics that were discussed or used included: an iPod-mini, diver's watch, high and low-end digital cameras, mobile phones, SD cards, CD-Rs, SIM cards and headphones. Discussion of these items naturally arises when people use the technologies or when they want to display them to others. Collaborative verbal problem solving relating to common travelling tasks (e.g. how to store numerous digital photographs) occurs and product suggestions are often made.

Cameras

Most of the backpackers in MIS-2 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 photographs with others in the subgroup. Sharing sometimes happened directly after taking the photograph. However, it more commonly occurred in more stable settings such as the boat, where a small group could look at photographs easily. Subgroup A(2) 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.

Backpackers regularly commented on their electronic devices without prompting by observers. One conversation related to the quantity of photographs taken and the relation of photographs to travel satisfaction. BP2 Indicated he had taken 180 photographs in the last three weeks of travel and that another friend had taken 400. This illustrates 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 photograph BP7 joked "*OK, we can go home now*." Similar comments were made in MIS-1.

Mobile Phones and Remote Communications

Five of the backpackers in MIS-1 carried and owned their own mobile phones. The non-owning member (BP2) used her husband's (BP1) phone as they were travelling together. All five reported both voice and texting (SMS) usage. Family and friends at home were common contacts and two participants reported using their phones to contact friends met while travelling. In MIS-2, 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.

BP4 sent several text messages while on the boat and received an international phone call while at the park. She walked away from the group and trailed them while talking for approximately 15 minutes. She said "I'm texting everybody all the time." BP5 also sent text messages to his girlfriend who lived in a nearby city. The experimenters also used both voice and SMS phone communications during the study to coordinate observations and inform external parties about the status of the study.

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.

Guidebooks and Journals

Guidebooks were discussed but not used during the field trip, and were a topic in the post-activity workshop. BP4 mentioned that she had not brought her Lonely Planet guidebook with her. However she had brought an iPod, a loaf of bread and carried a medium-size backpack. She indicated that she was using the guidebook to keep notes in the margins about where she went. During the workshop backpackers mentioned the currency and accuracy of information obtained at their current location, as an alternative to guidebooks. They also discussed problems with outdated information, bias of individual authors, lack of detail for large regions, and insufficient emphasis on budget travel. This quote describes the range of opinions on guidebooks.

> *BP1: The information centre, they have a lot more information [than guidebooks].*
>
> *BP3: But it is like really useful. It is right where you are, it is got everywhere we want to go. And it is divided into sections. So like places to stay, backpackers and nightclubs.*
>
> *BP1: Yeah but the best places…*
>
> *BP4: Are not in the Lonely Planet.*
>
> *BP1: But the places that are not there are more important to staying at.*
>
> *...*
>
> *BP4: The Lonely planet says they're for backpackers, but there is expensive hotels in there as well. And we really do not need that. I think it'd be great if they said where the nearest supermarket is. Like Coles or Woolworth's, you do not want to go the 7-11. There was nothing in there about Surfer's Paradise.*

These excerpts show strong opinions surrounding guidebooks, ranging from those that like predictability and organised travel tips to those that seek the unexplored areas and other sources of information. Using information centres or talking with other travellers was discussed in the following quote.

> *BP4: Never been to an information centre. I just ask other backpacker for information. Because other backpackers know the best spots. They really do.*

Lack of emphasis on budget travellers needs, such as cheap accommodation, coverage of smaller regions and practical necessities are also mentioned as problems with print guidebooks.

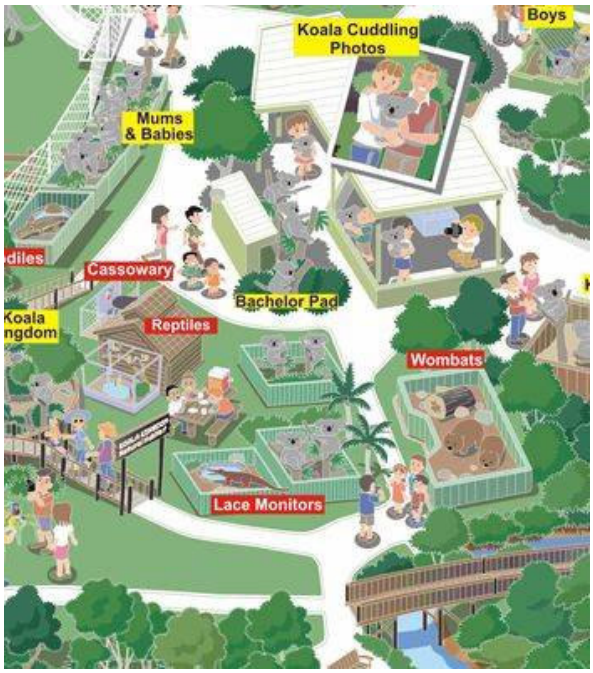


Figure 52: A portion of the park map. The bridge shown on the lower-right is the same as in Figure 53.

Figure 53: Holding maps in Figure 6 while walking to determine a route.

Maps were used fairly often during the day. Small handheld maps of the animal park were available and used to plan routes, see available activities and find the way out (See Figure 52, Figure 53). Some backpackers complained about the map and a few had trouble finding their current location on it; however, it was used effectively by many of the participants. One of the backpackers had obtained a free map of Brisbane city and others were looking at it and asking about getting one.

Figure 54: 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 55: 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.

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 55), which would help form a larger journal which she kept at the hostel. The larger journal contained clippings and memorabilia from her travels.

3.5.2.5 Influence of Type of Mobility on Group Behaviour

The results are briefly discussed in terms of *types of mobility*. This is because a great deal of mobile research does not identify this factor, and identify how it affects behaviour and resulting requirements. The MIS study consisted of three primary types of mobility: 1) walking to a destination, 2) sitting in a moving vehicle, and 3) walking around a location. As it is difficult to discuss the mobility of the backpackers without including other aspects of the situation such as group size, density of traffic, impediments to movement, geographical familiarity, noise levels and frequency of stops, these will also be mentioned as appropriate below.

Walking to a Destination

Backpackers knew that they were walking to the boat and were aware of the departure time of the boat. Consequently they were goal-directed, but did not know

the route or other variables such as how long the walk would take. They were also partially directed by social norms which would have made it impolite to leave the group. During both the walk to and from the boat, many situational variables affected the route taken, discussion topics, and movement patterns. For instance, BP4(1) needed money which dictated a route passing by a particular bank's ATM. Pedestrians waiting at stoplights or walking down sidewalks greatly restricted where backpackers could stand or walk.

Walking six-abreast was nearly impossible because of benches, sidewalk width and groups of other pedestrians. Consequently pairs walking side-by-side was easiest for holding conversations and the most frequent formation. Three or four walking in a row, or in triangle or square configurations was possible. However, these were awkward because of noise and angles of body positioning. The backpackers' movement cannot be discussed without simultaneously acknowledging non-movement. While their overall goal was to move, they had to stop several times for the ATM, traffic signals, car traffic and a queue to get on the boat. *Pauses* in movement such as this are often due to variables external to the backpacker and consequently are not practically predictable. Likewise, situations where the backpacker wishes to pause (e.g. when receiving an SMS message) are not always possible because of restricting (or enabling) external factors such as crowds of people.

Sitting in a Moving Vehicle

Moving vehicles provide both the situation of movement, typified by a high degree of environmental change, and characteristics of stable environments. In this case, the top deck of the boat offered a stable location to place objects and sit, while observing changing scenery outside the boat. While the seating arrangement was awkward for larger groups it was sufficiently large and stable to allow four of the group members to hold a conversation on the way there and all six members (and observers) to talk on the way back. Conversation rates were rapid throughout the day, but particularly when participants could sit down and face each other. Changing scenery outside of this stable group-discussion setting provided frequent and easy conversation topics which also stimulated conversation. Participants were observed fiddling with small objects such as keys in wallets or backpacks while seated and exchanging or examining others' items. This happened less while walking from or to the hostel for physical and social reasons.

Figure 56: Pointing at an item of interest from the boat.

Figure 57: Discussing an item of interest before the boat started.

Walking Around a Location

The Lone-Pine Koala Sanctuary covers 50 acres in a rural area outside Brisbane. Backpackers had two hours to view the park and its numerous exhibits. Other tourists were scattered through the park, but it was not crowded. These factors resulted in an activity context (Axup et al., 2005) which can be summarised as ‘see most of the park quickly’. This greatly affected how fast they walked, how frequently they moved on, which exhibits were not seen and whether they stopped for lunch.

Figure 58: Collaboratively taking photographs of feeding a roo.

Figure 59: A busy environment with attractions to see.

As the groups broke up into pairs there was much less conversation focused on ‘getting to know others’. As participants were directly interacting with a new environment, a large part of the conversation pertained to topics about the environment and activities within it. The park allowed an environment where stopping was possible, either to handle technologies such as cameras or to interact with animals. Participants carried what they needed in small backpacks. Sometimes they set down camera equipment bags near animals when they wanted increased flexibility of movement. Thus, even unstable mobile environments can be co-opted as a temporary stable environment to facilitate tasks. Walking around the park did not leave a clear optimal path, such as occurred during the walk to or from the boat in the city. This lack of clear restriction by the environment or definitive goal for the group as a whole is likely to have been a factor in the group splitting up.

Summary of Types of Mobility

The physical location, arrangement and activities of the group greatly affected resulting conversational topics. Stable environments (e.g. docked boat, lunch café) afforded sitting, easy device usage and conversation about future plans or reviewing previous events. Unstable mobile environments (e.g. walking) provided rapidly changing stimuli which continually prompted conversational topics and encouraged movement in pairs. Stable, mobile environments (e.g. moving boat) provided mixed effects. On the morning boat ride, audio announcements and new scenery greatly affected group communication in ways similar to mobile environments. On the ride back, the lack of audio announcements and previously experienced scenery supported conversational trends similar to stable environments.

3.5.2.6 Effects of Types of Stable Environments on Group Behaviour

The only reasonably stable environments used by the backpackers during the field trip were 1) the boat for 30 minutes before it left the dock and 2) a café at the animal park. It is notable that both of these were unexpected by the researchers and only two participants used the café. Both of these occurrences were used as opportunities to learn more about each other and in some cases make plans for later.

Movement in unstable environments provided sources of distraction and topics of conversation, while stable environments encouraged discussion on more abstract topics. BP4 explicitly mentioned an aspect of this in the workshop. She said “You do not have a subject to talk about when you're in a quiet place, whereas [at the park] you can always talk about the animals.” This is not however a hard and fast rule. For

example, backpackers did talk about recent travel locations and activities from the previous night while walking to the boat (a non-static environment). However they also discussed public art and a tourist park which were prompted by seeing them in the immediate environment. Static environments permitted distribution of carried technologies (e.g. bags, cameras) around the backpacker. Table-tops and chairs were used for this in the café, and chairs and floors on the boat (see Figure 60).

The boat had some of the qualities of a static environment such as the ability to walk around (being mobile in a mobile environment), sit and set down carried items. However the boat was more unpredictable and offered less freedom than more stable settings. For instance, competition for seating resulted in seats being taken from backpackers (and observers) at times and only certain portions of the confined space of the boat were public.

Figure 60: BP1 rests two containers on the floor next to his bag. These are impersonal items that are not kept close to the body.

Figure 61: BP2 chooses a seat for himself and BP1 on the boat trip to the park.

Different stable 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 61) only fit two people. This supported single strangers meeting or couples

interacting, but did not 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.

3.5.2.7 Conversational Openings and Determination of Social Position

There were many questions backpackers commonly asked of each other during the early stages of meeting one another. These included: “Where you from?”, “Where you going to”, “Where were you at before?”, “How long have you been travelling?”, and “How long have you been in this city?”. These openings appear to revolve around the concepts of location, time and experiences, and operate at different levels of specificity. For instance, asking about location at birth (home) gives an idea of background. Location a week ago, gives an idea of potential advice topics, or possible shared social ties. Location a week hence gives an idea of expected behaviour and goals. We observed backpackers rapidly asking these questions and quickly getting a fix on who the other travellers were and how they were socially positioned. Duration, location, direction and names (of people or places) are important data for backpackers to maintain safety and make future plans. Results from the previous interviews with backpackers identified similar issues (see Section 3.4.2.3) and resulted in negative feedback regarding this ritual. While it does serve a practical purpose, it may be tedious to repeat on a regular basis. There is potentially an opportunity for technologies to automate or augment this process, and match backpackers with affinities so that they do not need to do the sorting process themselves. However, it should be remembered that this ritual may serve other subtle social functions which would be lost in an automated system.

3.5.2.8 Missed Opportunities For Information Exchange

In MIS-1, there were a substantial number of missed opportunities for information exchange in the group of six backpackers. Our sample size does not have sufficient statistical power, however percentages are shown to more clearly indicate the degree of problems. 17 of 24 potential future travel location topics (as indicated by the participants on the introductory questionnaire) never occurred, and 5 of 7 never occurred for identified travel related questions. This was despite being primed by the introductory questionnaire, which was completed the day before the field trip. Similarly in MIS-2, 52 responses about desired information were given by 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 included: 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.

In summary, in a group activity lasting 6.5 hours topics which the backpackers indicated were important to their future were often not discussed. This could be for several reasons:

- Sometimes desired questions had no people with applicable information in the group. For this information backpackers would have to look outside the group. This is a design opportunity for linking groups.
- There are also many topics of interest to backpackers other than what they wrote down on the form. They may have been discussing these topics instead. This certainly happened, although not all backpackers participated in all discussions and it is likely some topics that were discussed were not of interest.
- They may also have been distracted by other events during the day and did not remember questions pertaining to their current problems or travel plans. An automated system could potentially remove the burden of this task from the distracted backpacker.

Regardless of what combination of these explanations is true, there was still a substantial amount of useful experience (i.e. knowledge capital) in the group which was not taken advantage of (i.e. accessed) by the time the group dispersed. Adding weak external social ties or the ability to retain weak ties within dispersed group members would be likely to increase collective knowledge capital and quality of the travel experience (Hampton, 2001; Kavanaugh, Reese, Carroll, & Rosson, 2005).

3.5.2.9 Sharing, Trust, and Cooperation Amongst Backpackers

As part of previous project work I interviewed backpackers about their travel (see Section 3.4), including asking about sharing, collaboration and gift giving amongst the backpacker community. They indicated broader systems of sharing, which usually took place overseas, such as book exchanges, shared households and clothes swapping. To my surprise, we observed a great deal of interpersonal collaboration and sharing during a one-day field trip here in Australia.

Figure 62: Collaboratively storing items in backpacks.

Figure 63: Sharing a photo with the researcher.

Upon arriving on the boat the backpackers set their bags on their laps, the floor or nearby chairs. They usually opened them to use various items or simply fiddle with items in their hands. This resulted in a discussion about BP2(1)'s deodorant which was handled by others in the group. A water bottle was shared between BP1 & BP2. BP3 was collaboratively carrying personal items with BP4 and handed him an ID card and a wallet. They appeared to be using the same backpack even though they had only met the day before. BP5 & BP6 had opened a backpack and were exchanging items from inside their backpacks. They played with flower decorations attached to their bags and one touched the other's necklace. BP4 took out his camera and showed it to the other three backpackers in the subgroup. BP3 took out her iPod and let the group look at it while explaining how she used it.

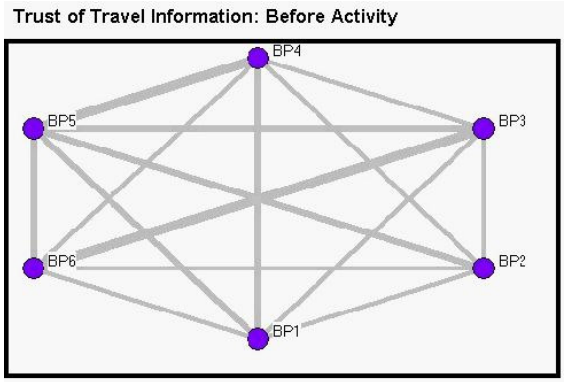
BP1 & BP2 shared carrying several large camera bags, rain jackets and other clothing. BP1 used hand gestures to communicate directions to go across a large field to see a new pen of animals he saw there. BP2 managed the camera bags while BP1 went a short way away to take pictures of wallabies. BP2 handed a rain jacket to BP1 to carry, who eventually put it inside a backpack he was wearing. They also shared a bag of 'roo food' for feeding the animals. BP4 & BP5 had lunch together and BP4 offered some of her food to him. Other backpackers commonly shared cameras, usually to take pictures of each other with the animals. This often followed the pattern of 'switching' where one posed while one shot, and then the vice-versa. Sharing photographs was common and one backpacker joked about getting a copy of the research video for friends at home.

On the boat, printed photographs purchased at the park were handed around the group and comparisons made. This led to a review of photographs on various digital cameras taken of the koalas and other activities. Cameras were physically handed to others as well as being held and shown to others. BP2 gave BP4 her sunglasses as a gift because she had bought new ones and BP4 needed some. BP4 offered some of her snack food to one of the observers and BP1 did the same with a juice drink later. BP4 was familiar with special offers from the juice shop and helped the others decide orders and how to get discounts.

In MIS-2 backpackers on the field trip discussed travel experiences and gave advice or tips, both to other backpackers and observers. This did not 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.

To gain a different perspective on trust, questionnaire data was also used to visualise trust formation between group members. Trust was rated on a 5 point scale: 0 (never or very low) to 4 (often or very high), and the resulting answers were used to generate the diagrams below.

Figure 64 and Figure 69 show the before and after depictions of group trust: it shows a noticeable lack of change. This confirms interview results (see Section 3.4.2.2, 3.4.2.3), in-situ observations in this study, and other research that backpackers tend to be very trusting of other backpackers, even without shared experiences (Richards & Wilson, 2004). Backpackers also tend to be experienced at sorting good and bad advice even if the informant *is trusted* because individual opinions vary.



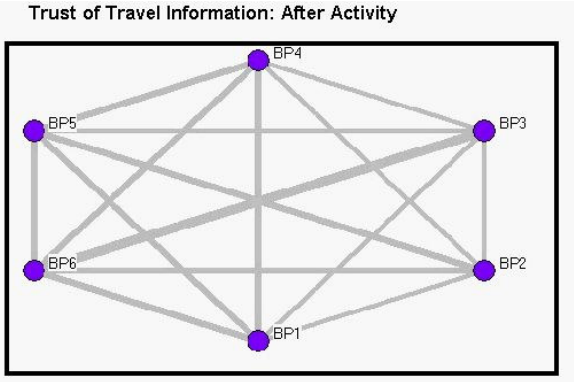
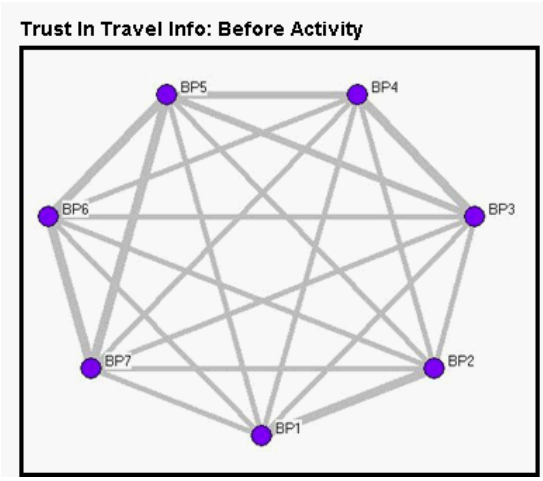


Figure 64: MIS-1 Before: Trust of travel information between group members before the field trip. Wider tie lines denoted increased reciprocal trust as perceived by both members.

Figure 65: MIS-1 After: Trust of travel information after the field trip does not show significant changes from previous high levels.

Similar results were found in MIS-2 for inter-traveller trust (see Figure 66 and Figure 67). The ties have grown slightly after sharing the experience of the field trip and learning a small amount about each other, but again these travellers reported that they trusted advice from each other when they first met.



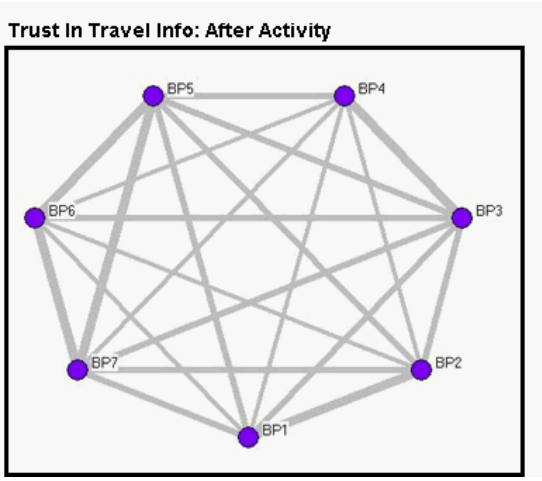


Figure 66: MIS-2 Before: Trust in travel information from other backpackers is reasonably strong before they spend time together.

Figure 67: MIS-2 After: Trust following the field trip remains strong. Backpackers implicitly trust other backpackers information.

3.5.2.10 Play and Enjoyment

Throughout the day backpackers maintained a light mood and were socially playful at times. BP4(1) joked that she “could go home now [Holland]” because she had fed some of the native wildlife and this was her purpose for travelling. BP2 mimicked eating the roo food while they were feeding the animals and shortly after BP1 mimicked feeding roo food to the video camera which we were filming with. Participants started to become comfortable with the camera about half-way through the field trip. They did more “performative” actions that played with being filmed on the boat back and while walking back to the hostel. BP4 also joked about the experimenters doing studies on “how people talk to animals” after she had been video-taped doing this. Other jokes concerned varied topics such as transsexual kangaroos, ‘photo-shopping’ out undesired people in photographs, and using backpackers’ relatives for free places to sleep. There were a number of jokes on the pre-recorded tourist announcements, which the backpackers often laughed at or commented on afterwards. For example while passing the Castlemaine Brewery (which produces a beer called XXXX) the following joke was told.

> *Some people from across the Tasman [Sea] say we call it XXXX because we can not spell beer. Well the joke’s on the Kiwis, because they own it. Yes, Castlemaine Brewery was bought by Lion Nathan of New Zealand a few years ago. Well Kiwis, we do not mind if you can not spell, we still drink the beer.*

The observers noted several occasions throughout the activity where backpackers particularly seemed to be enjoying themselves. When first entering the animal park they were surprised and ecstatic about seeing the first Koalas. Many of the participants had photographs taken holding a Koala and enjoyed this. Many participants also enjoyed feeding kangaroos and wallabies in the field. Back on the boat comparing and viewing printed and camera-based photographs resulted in laughter and enjoyment. Shortly after this, BP3, who had heretofore been quiet, broke into a long and energetic account of her recent travels in New Zealand. Shortly after, BP4 told an entertaining story about work opportunities posing for men’s magazines in Sydney. Conversations on the ride back were more relaxed and energetic, and appeared to be more fun for the participants.

Backpackers frequently related stories about fun things they had done while travelling. BP3 related stories about skydiving and losing her top while bungee

jumping into a river. BP1 related a story about drinking lots of Guinness and trying to fit large numbers of people inside a Mini car for a contest. BP4 related a story about a recent road trip in the following quote.

> *BP4: Then I went back to Sydney, cus some friends from Sydney were coming back up there. Stayed there another 6 days, then Surfer's Paradise. My road trip from Sydney to Byron was absolutely the best. It was really basic, and we did not have anything. So we slept in the car, and on beaches, and on grassy knolls. It was really cool, they have like free barbeques everywhere. And every beach has like showers and stuff. And we did not have a cooker or anything, so we put it on the bbq. And we did not have a knife and a fork, so we ate out of the pan. It was amazing. Cheap wine every night.*
>
> *BP1: Back to nature huh?*
>
> *BP4: It was really cool. It was the best. I'd rather do that again than stay in a four star hotel.*

This description of BP4's recent trip describes several common situations. She has taken a spontaneous trip where they travelled in a small group and simply explored what they could on a very small budget. The emphasis is placed on the uniqueness of the travel experience rather than the level of comfort. She explicitly indicates how enjoyable this was. The original comment refers to her plans after this trip and indicates a meeting with friends met in Sydney, to travel further with. Joining or splitting up with temporary travelling partners is a common aspect of travel stories.

3.5.2.11 Problems and Difficulties

Backpackers both experienced difficulties during the day and discussed problems that they had on previous parts of their journeys amongst themselves. In both cases, backpackers sometimes expressed the issue as a problem, but sometimes it was simply related as an experience. We noted situations where difficulties could have been averted or where new tools or design changes could have made things easier or more enjoyable. Categories and examples of problems our participants experienced are listed below.

Trouble Locating Products or Resources

At the animal park several backpackers wanted to find a water tap to fill up a water bottle, but did not know where to find one. BP3 wanted to find pants in an uncommon

size and was not sure where in the city they could be purchased. This was complicated by different sizing standards and brands from her home country. She was also looking for a specific type of bra and was not sure where to find one. BP4 stated that she wanted chocolate at one point but was not sure where she could get it nearby.

One backpacker was interested in sharing a ride to a city up the coast but was considering public transport. She was not sure about costs of bus tickets going North or if there were better methods of finding people going the same way. Cost was a critical factor in her decision (also see Cost Of Travel section below).

> *BP4: Maybe I'm gonna buy a bus pass from here to Cairns. If I can get it for $35, then I'll do it. But I hope I can get a lift to Hervey Bay, and from Hervey Bay to the Whitsundays, and Whitsundays to Cairns.*
>
> *BP2: [unclear]*
>
> *BP4: But, well, I often meet people...*
>
> *BP2: How do you find them?*
>
> *BP4: Usually I just look at the message boards in hostels. It is safer.*

Social pairing technologies would need to facilitate these kinds of activities while maintaining or improving the level of safety of existing methods.

Determining Social Function of Geographic Areas

Several backpackers walked into part of the food vending area of the park and could not determine whether they could order food there. It turned out to be a buffet section for tour groups and the food cost was very high. The backpackers had to find staff to ask where they could eat, “Do we have to pay, or….?”.

Quality of Local Services

The seafood at the kiosk was deemed to be expensive and of poor quality. Backpackers wished they had bought food elsewhere or gotten advice on what to order. One of the backpackers was unsatisfied with the quality of the commercial photographs she had purchased. Fortunately other backpackers had the foresight to take photographs of her at the same time, which she could copy.

Understanding Public Announcements in English

Some of the backpackers complained about not being able to hear announcements on planes and public transport. This was partially because of language abilities, fast speech rates and noise in public rooms.

Cost of Travel

Backpackers often complained about the cost of food and other services. There were a number of conversations about recent travel experiences where other backpackers asked the cost of doing different activities. They also wanted to know the cost of "going to a place", which included cost of travel, duration of travel, style of accommodation, tours taken and other variables. Several of the backpackers were travelling on borrowed money and attempting to find cheaper alternatives. One of them told the following story about her expenditures.

> *BP3: I could use my mother's credit card. My mom gave me a credit card for if there is an emergency. I put a thousand dollars on it. She did not do anything really. Not while I'm out of the country. I can not afford to pay for it, so I'll put it on the card.*
>
> *BP4: <giggling>*
>
> *BP3: Hey Mom, guess what, I put a thousand dollars on your credit card. She's like, you did what!*
>
> *BP1: Well, you've got the rest of your life to pay it off.*

BP4(1) indicated that she joined the research study because she would not have been able to afford the park trip on her own. Backpackers commonly complained about spending too much money and trying to project how long they could continue to travel on finite funds. Participants commonly discussed finding the cheapest option for a given item or experience, and several viewed this as part of being a backpacker. After returning from the animal park, BP4 mentioned this.

> *BP4: I really do not feel like a backpacker anymore. I feel like a tourist now.*
>
> *BP1: And what is a backpacker then?*
>
> *BP4: Backpacker is someone who does everything cheap, and does not want to pay for anything. They do not pay 15 bucks to get their picture taken cuddling a koala.*
>
> *BP2: 15 bucks is not that much.*

BP4: Ya well, I can eat for that, for three days.

Safety of Belongings, Trust, and Losing Important Items

BP3 gave her airline ticket to an airline worker as part of the process of finding a checked bag that had not arrived. When the bag finally did arrive BP3 & BP6 accidentally left without getting the ticket back. This was related to a lack of baggage tracking at airports and poor customer service practices at the airport. At a previous location she had also dropped her passport in a hostel lobby while drunk but had fortunately had it returned. On a related note, BP4 reported sending a message to a boyfriend while drunk and forgetting about it. It did not result in a problem, but provoked an unexpected and confusing response the next day. BP4 had valuable items which she regularly left in her room with strangers. She said she “trusts them not to steal”.

BP4: Why did you bring all that?

BP2: I always carry my tickets with me.

BP4: Ya me too.

[unclear]

BP2: Never trust anybody.

BP4: You can trust me, you can trust [BP5]. I leave stuff in my room all the time, like my iPod, my telephone, and my passport, my tickets. I'm staying with five people, and one of them's my friend.

Others: [laughter]

Phones or other electronics that require recharging from a wall electrical outlet often result in these items being left unprotected in rooms.

Questions About Environmental Objects

Many of the animals at the park were unfamiliar to the backpackers and those with English as a second or third language often did not know their names. Signs on the pens provide some information, but the backpackers asked a number of questions of park staff and did not get some questions answered. Sometimes staff answers were too brief and backpackers wanted more detailed information.

Information About Local Customs or Operations

One backpacker wanted to know if a supermarket was open after 5pm. They considered that it might be Good Friday, an Australian holiday which they were unfamiliar with. They concluded that it was a holiday and probably not open. In fact it was not a holiday for another week, and it probably would not have affected operating hours.

Choosing and Carrying Gear

Backpackers expressed gear related difficulties such as storing large amounts of digital photographs, how to ship unwanted items home and whether or not to carry sleeping bags with them. These travel issues are discussed at a high level of detail and this is how solutions to problematic situations are spread.

> *BP4: Here it is not that expensive, and they have cool stuff. So I'm gonna buy a lot of that before I go back. I think I'm gonna do that a month before I go back, because otherwise I have to carry it around the whole time.*
>
> *BP3: Oh ya.*
>
> *BP4: I even thought about throwing away my sleeping bag because it weighs so much.*
>
> *BP3: How much?*
>
> *BP4: 2 kilos.*
>
> *BP3: Ours is only 800 grams.*
>
> *BP4: Wow.*
>
> *BP3: I've only used it once tho.*
>
> *BP4: But I'm going to Melbourne in June or July and it'll be cold out there, so I think I'm gonna keep it.*

Participants also offered advice on hostels providing bedding, temperature in different areas, size or different brands of sleeping bags and other issues.

Accommodation

Backpackers discussed where to get cheaper rates and the quality of accommodation where they had stayed. They complained about noise outside the

room windows, problems with other guests in the rooms, dirty sheets and other issues.

Problems of competition for space and resources in busy hostels came up as an issue. For instance BP4 had not done her laundry because there had been a line waiting for washers. Getting access to showers, toilets, café seating, single rooms or other resources can be an issue in some hostels.

Technological Difficulties

The mobile phone used by BP4(1) went dead shortly after arriving at the park because of an insufficiently charged battery and a long phone call. Phone batteries do not last more than a day or two when under heavy use and charging phones in hostels is often inconvenient. This reinforces findings from previous interviews which also mentioned this as a problem (see Section 3.4.2.11). Her iPod had also gotten visibly dirty during a job assignment where she was handing out newspapers on a street corner. She used it during the trip to relieve boredom during a lapse in conversation and indicated that she used it regularly. She said fairly seriously that “If I lose this I’m going home.” Personal music players provide entertainment, excuses to ignore others in the environment, protection from noisy environments and cures for homesickness. They are starting to hold so much music and other personal information that losing them is a worry, particularly for users with little money to replace them and inaccessible music backups. This is similar to issues that affected the original introduction of the walkman and other music players (Bull, 2000).

Backpackers complained about phone cards and having to punch in long strings of numbers and learning international dialling prefixes. Phone cards often have poor automated answering systems and complex lists of local dialling numbers. Phone cards were used because of the cheaper rates they offer than international mobile phone calls.

BP1(1) spilled some water over his bag while opening it which could have touched his camera equipment (but did not). Likewise, both the observers and the participants concerned themselves with keeping equipment dry during the heavy rain shower lasting 45 minutes. One camera was cheaply made and did not have a lens cover, which caused anxiety about scratching the lens for its owner. Sharing photographs via the screens of digital cameras is common, but the small screen size and sun glare posed problems for the backpackers.

Backpackers were interested in how to store large numbers of photographs, get them off of cameras and share them with others in the group and at home. They discussed memory card technologies, CD burning, mobile media players, TV interfaces and web sites amongst themselves (also see the section 'Waiting on boat' above for a transcript of part of this conversation.)

3.5.2.12 How Prototypes Were Used

Backpackers in MIS-2 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 and the social and physical environments they are used within.

This section begins with a practical discussion of how 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. After this, there is a brief discussion of product requirements that resulted from in-situ usage and an exploration of why certain prototypes were not chosen. This is followed by a discussion section covering in-situ usage, design trade-offs, market demographics, requirements and design issues.

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 did not 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 have not really modified it because I have not 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 visualisation 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 pockets or backpacks for 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 Figure 82) whose 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 did not 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 did not use the whole day!*
>
> *BP5: Well, I did not 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 Figure 78) 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 is small, it is discrete. It fits in the pocket, it is flat. The cut of it feels nice.*
>
> *Interviewer: So it is 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 68). The necklace (see Figure 80) 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 68: Demonstrating a head-mounted display wirelessly connected to the tablet stored behind the body.

Figure 69: 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 68) and BP3 gestured to indicate how a sign-language communication system would work (see Figure 69).

3.5.2.13 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.

The backpackers had practical concerns about using the prototypes. Being foam, they are relatively small and light which makes it possible to lose them easily. They were uncomfortable with certain features and they used 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 was natural and fun for them.

> *BP5: I should draw on mine. Where is mine? I hope I have not lost it.*
>
> *[They talk about it looking like a Tomogotchi (Japanese game)].*
>
> *BP7: I do not 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?*

BP7(2) had a lot of practical concerns about her device. She was worried about it being too fragile, and about how she can carry it. She was 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 was concerned about scratching the camera lens (a member of their subgroup has a camera with the same problem.) Despite these utilitarian concerns, she did not carry the prototype in her pocket because it is slightly too large. It would show through her pocket, making her pants look “bulky” and consequently make her look less attractive in group photographs. So social and aesthetic concerns were considered when weighing design options, but in ways specific to the individual.

> *Observer: What else could it do?*
>
> *BP7: I'd want it to be able to fit into my pocket without getting damaged. I do not want a round screen. The text does not 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 did not want bulky pockets in the photo.

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.

3.5.2.14 Design 1: Free Phone

Figure 70: Additional news, weather and hostel comparison features have been added.

Figure 71: 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 to 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 recognise 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 do not 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 did not 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.

3.5.2.15 Design 2: Location-aware Tablet

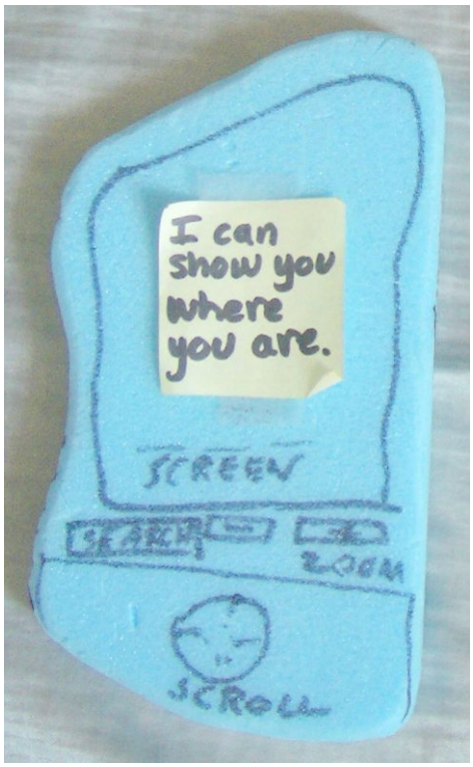


Figure 72: A location sensing tablet computer has had a screen, buttons and a fold-out thumb keyboard added.

Figure 73: 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 where they were, paths to objects or desired destinations.

BP4 (male, 26-30 years, from Sweden) chose the tablet 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.

3.5.2.16 Design 3: Geo-tagging

Figure 74: The geo-tagging device offered virtual-graffiti functionality.

Figure 75: A participant discusses why he did not 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, Mitchell 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 get much use.

BP1 indicated that there had not 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.

Another discussion introduced the topic of kiosks, whether information would be more useful at the park or from the hostel, and how the device would exchange information with a kiosk.

> *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 do not 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 is in a different language as well.*

BP1(2) drew several small items on the back which were a microphone, speaker, activation button and a sensor to connect with an external kiosk.

3.5.2.17 Design 4: Visualise Group Members

Figure 76: A circular screen and buttons has been added by a backpacker.

Figure 77: 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 visualise 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 had not been many opportunities to use the device. "*Mine can show the location of other group members, which I did not really use today. But I could see that it could be quite useful, if it worked all over the world, and did not 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 were not 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 visualise 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 do not have mobiles. [pause] I did not know what time you two [gestures at BP6 & BP7] were arriving yesterday. You did not have mobiles. It would have been quite good to find out. I went out yesterday, and I did not 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 visualise 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 would not 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 visualising all seven members of the study group. With BP7, the social bond between her and the unfamiliar backpackers in the study group (BP 1,2,3,4) is not high (see Figure 50, Figure 51); 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 emphasises the need to add (and presumably remove) people on a case-by-case basis.

3.5.2.18 Design 5: Object Identifier

Figure 78: A device for identifying objects in the environment.

Figure 79: 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 recognising 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 had not been much use for the device and that it probably was not very practical for a backpacker. "*To be honest I did not mark it because I did not see much use for it. Personally if I wanted to know, I'd ask a fellow traveller or get some information. I could not justify spending money on something you could do other ways.*" He indicated that it often was not 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. Also, as mentioned previously (see section 3.5.2.12), 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.

3.5.2.19 Design 6: Digital Wallet

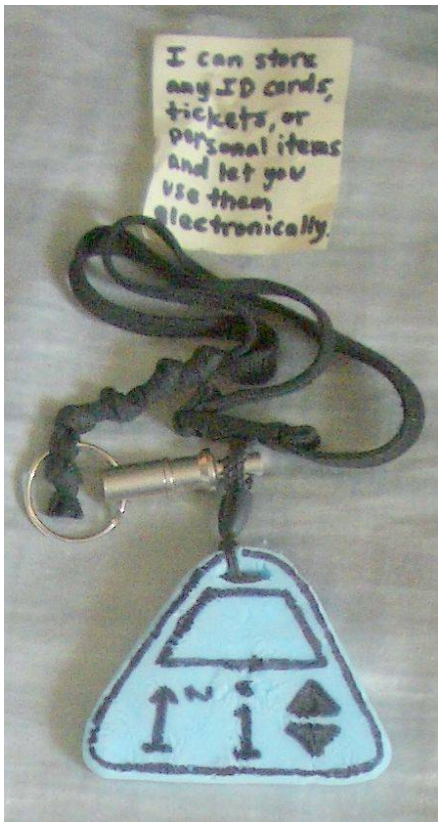


Figure 80: Information and navigation buttons have been added to the digital wallet.

Figure 81: 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 this prototype. She did not end up using it as a wallet, but borrowed a feature from Design 1, which supported 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 did not 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 not 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 very accurately 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 46, Figure 47) 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.

3.5.2.20 Design 7: Bargain Finder

Figure 82: The triangle shaped prototype was not marked up.

Figure 83: 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.

The Bargain Finder prototype did not 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 this prototype. She repeated the conclusion that there had not 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 do not 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 is 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 recognise 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 are not (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.

3.5.2.21 Requirements Discussions Resulting From Prototype Discussions

Discussions about a prototype often resulted in comments from participants who were not currently presenting. 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. Also please see the related Discussion Section 6.4 which covers the topic of using ethnography to form requirements.

A number of product requirements are touched on in the following conversation. 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 is not 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.

> *BP7: It could be quite useful, if it [Design 4] works all over the world and did not 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 is 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 does not cost any more money to text, but that is because it is a New Zealand mobile [plan].*
>
> *Interviewer: So you would not 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 is not worth it. <pause> I do not know how it would work. Whether you'd buy a set of them.*

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. 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 are not 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.

> *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 was not very much information.

BP4: There was about the koalas.

BP5: Ya, but we did not see very much information about the kangaroos.

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

Interviewer: So you're saying that there is 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

The backpackers also came to a number of conclusions about the hypothetical design in the following 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.

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 do not know, if it was at the animal park. And all these different little kiosks; I do not know that I could be arsed to do it. But if it is 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 is quite simple, if it is 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 is 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.

3.5.2.22 Prototypes That Were Not Chosen

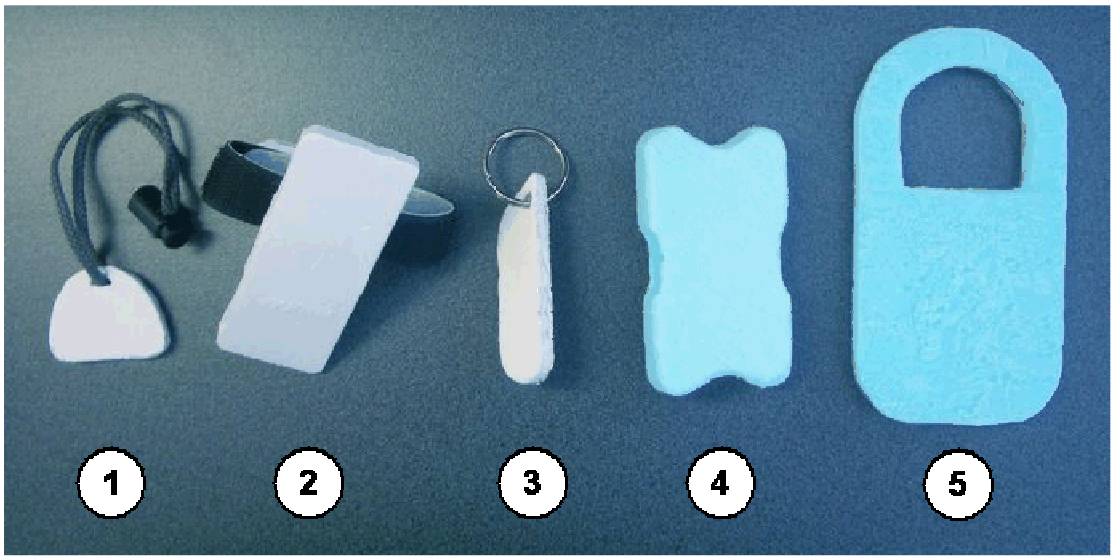


Figure 84: Five prototypes were not chosen by participants.

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 did not 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 84) 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.

3.5.3 Discussion

There are a number of design issues which became apparent while running the study that are listed in the following section. This is followed by a section looking at why running the study in-situ worked well. After this is a list of design tradeoffs relevant for mobile community design. One possible preliminary market segmentation envisioned is also provided, as well as requirements for mobile tourism technologies.

3.5.3.1 In-situ Usage vs. Hypothetical Usage

The field trip in MIS-1 resulted in 290 direct visual observations and 917 audio recorded comments about behaviour. These observations contributed to identification of 37 problems experienced in a normal backpacker activity. These problems resulted in the identification of 35 product feature areas, each with a variety of product possibilities (See Section C.1). Backpackers interviewed after the activity frequently had trouble recalling instances of abstract categories (e.g. “Which people external to the group did you talk to?”) and were not aware of many aspects of their own behaviour (e.g. having difficulty in gauging the cost of travel.) Many of these conversations were prompted by social or physical situations in the environment. No one can predict these situations and no one (including the researchers) remembers all of the details of a day in the life of a backpacker. It is likely that it will be methods which are situated in users’ natural environments and amongst the people they normally interact with, which will produce justifiable and viable design ideas for future products (Brewster, 2002; Squires & Byrne, 2002).

It is very natural for backpackers to talk about travel information, jobs, inexpensive ways to travel, their home countries and technologies they use. Simply giving them a natural environment to talk amongst themselves in gives sufficient data on topics of interest. It also provides a natural gauge of how important the issues are to them.

3.5.3.2 Design Trade-offs and Tensions

In the course of the MIS-1 study and related research with backpackers we have identified a number of “design tradeoffs” or divergent design goals. Other researchers have commented on the role of these design tensions (Engeström, 1993).

The design goals listed in Figure 85 appear to be opposing, but there are often compromises available that satisfactorily meet both goals. There may also be other dimensions to the scale, which allow avoiding the detrimental effects of either end of the scale. For instance, providing a safety scale to backpackers might allow them to choose a comfortable level of risk, either high or low. Likewise, anonymous communication could be supported for certain types of communications, while proven identities could be required for other types of communication forums. It is through the process of tangibly depicting extreme goals on either side of a spectrum, that design solutions can be found. We intend to explore some of these issues in further collaboration with backpackers.

Design Trade-off Spectra For A Mobile Travel Assistant For Backpackers

Safety	|----------|	Adventure
Detailed Travel Information	|----------|	Information Overload
Identity, Reputation, Responsibility	|----------|	Anonymity, Personal Growth, Freedom
Physical Interaction With People	|----------|	Physical Interaction With Device
Popular Location	|----------|	Unvisited Location
Directed Travel, Meeting Expectations	|----------|	Exploration, Unexpected
Commonly Available Technology	|----------|	Advanced Technology

Figure 85: Spectra between opposing design goals.

3.5.3.3 Backpacker Market Segmentation and User Profile

Backpackers in this study varied in a number of important ways. They were all doing roughly the same type of travel, but different characteristics resulted in different needs. Some of those differences and what they mean are discussed here.

Age: Backpackers in this study ranged in age from eighteen to mid-thirties. They had different travel goals based in part on how old they were. Younger travellers wanted cheaper travel options and were willing to withstand worse conditions. Older travellers tend to have more money and use different travel options.

Travel experience: Some participants were on their first trip, while others had travelled many times before in different locations. This affects who they partner with when they travel and where they go, among other things.

Single, or pairs and small groups: Singles often want to meet others regularly. Pairs which are couples tend to spend more time on their own, and are sometimes shunned by non-couples. Pairs who are friends may be in the middle of this spectrum.

Gender: This is likely to affect shopping needs, modes of travel and accommodation options, among others. Backpackers in Australia are fairly evenly split between the genders.

Budget: In this study, two of the younger participants had very little money. The older participants had more, but this is not necessarily representative. It did show a marked difference in types of information they were looking for.

Duration of travel: Most of the backpackers in this study had been travelling for around a month. However, the length of time on the road affects money remaining, level of fatigue and how much time is spent in each place, among other things.

Working or not: Many backpackers do work, and one in this study was currently doing so. This usually results in a person staying in one or several locations longer than other travellers and needing different types of resources.

On holiday (vacation) or travelling: It is common for people taking shorter trips to merge with longer-term travellers. Examples include university students, school students on break or tourists looking for a short break from home. This represents

different goals, money, and lifestyles. None of the backpackers in this study were on short vacations.

3.5.3.4 General Requirements Resulting From Observations

Analysis of problems and enjoyable experiences of backpackers resulted in ideas for new products or functions, which would help solve or enhance these issues (see Appendix C.1). There were also broader requirements, that are not functionally specific, which arose from field-trip observations and post-hoc analysis (see Appendix B.1). The requirements listed should be treated as general, proposed, and necessarily incomplete. They may not apply to all product types; if a specific product were being designed, the source data should be reviewed for results pertaining to requirements relevant for that type of usage. Relevant context is created and determined by the type of activity, user and environment (Chalmers, 2004). Therefore requirements (which are necessarily context-dependent) should be tailored to the relevant design goal.

3.5.3.5 Design Issues

Please see Appendix A.2 for a list of design issues.

3.5.4 Summary

The two iterations of the MIS study were intended to understand naturalistic mobile group backpacking behaviour and communication, and to begin introducing basic mobile prototypes into that setting. This eventuated in a ‘field trip’ consisting of different mobility stages: walking to a destination, sitting in a moving vehicle, and walking around a location. Participants considered usage of the prototypes in various situations that naturally arose. Significant factors included the degree of mobility, stability of the environment, and activities engaged in. These greatly affected development of social ties, communication topics and device usage. Results relating to social relationships have been made more tangible through the use of social network diagrams which are used to depict mobile group communication, interpersonal bond and trust. These social metrics are useful to understand the social environment of mobile groups, with which mobile devices interact and facilitate activities. Participants selected seven prototypes of a possible 12, and provided in-depth discussions of how they could be used in realistic situations. These designs, as well as numerous requirements resulting from observations and discussions with

backpackers are outputs of the study. The field trip methodology also stands as a demonstration of how to run mobile group design studies.

3.6 Research Study: Social Pairing Exercise

There is a new world emerging around mobile social networks and the technologies used to facilitate and mediate them. It is technically feasible for mobile social software such as pairing systems to introduce people to others and assist information exchange. However, little is known about the social structure of many mobile communities or why they would want pairing systems. When these systems are built, it is not clear what the social response by those communities will be or what the systems will be like to use in practice.

While engaged in initial work interviewing backpackers (see Section 3.4), I saw a potentially useful application for a pairing system which would facilitate the exchange of travel information between backpackers. To explore this area, I designed two studies involving usage of a low-fidelity prototype social pairing system by backpackers. Backpackers rated the utility of different pairing types, and provided feedback on the social implications of being paired based on travel histories. Social network graphs resulting from the studies showed backpackers who were hubs in the network of travel information. It also demonstrated the effect of travel direction on information utility. Practical usage of the *social network pairing activity* and the implications of broader societal usage are discussed. The following sections cover the method, results, analysis techniques used and discussion of the results.

3.6.1 Method

Two workshops were conducted to investigate requirements for a social pairing system for backpackers. The workshops followed each of the iterations of the MIS study (see Section 3.5) and used the same backpacker participants. Please see Section 3.5.2.1 for a description of the participants used in both iterations of the workshop. Both workshops were similar in structure, but the results are presented separately to allow comparison and show iterative modifications to the research method.

While recruiting participants, hostel staff distributed a questionnaire concerning the participants' recent travel history, future travel plans and any travel-related questions

they had. Following their field trip to the animal park, the social pairing activity was conducted back at the hostel. It was intended to explore the utility of externally imposed social pairing systems for travel assistance. While the backpackers were away on the field trip, another researcher had paired backpackers in the group who had an affinity based on planned/visited locations. For example, BP5 had recently been surfing in Byron Bay and BP6 intended to travel there. Index cards were created for each participant, showing up to three people they should talk to and the compatible information they should talk about. Each backpacker was asked to spend roughly 5 minutes talking to each of the people they had been paired with (see Figure 86). Following the pairing conversations, a researcher 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.

To additionally explore how social networks change over time, backpackers were given a sealed envelope before leaving. It was requested that they wait a week to open it, and then complete and return the enclosed postcard (see Figure 87). The postcard asked if group members took part in activities with each other after the study and whether they contacted each other after leaving Brisbane.

Figure 86: Participants rating and discussing topics.

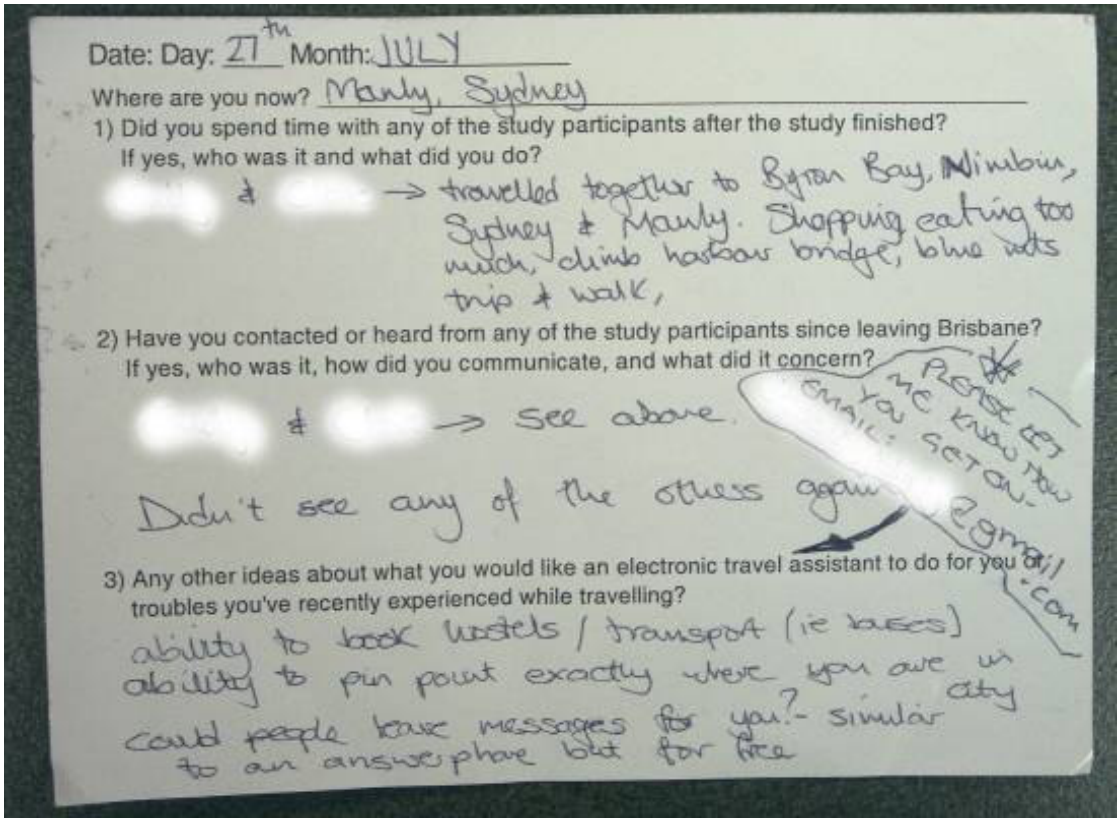


Figure 87: A postcard returned a week after the study explaining longitudinal social tie development (names erased).

The structure of the second iteration of the study was similar to the first. Pre-arranged cards were distributed to backpackers with suggested discussion items. However, due to difficulties tracking the results of individual conversations in the first study, a simple rating system was introduced for each conversation (see Figure 88). Participants were asked to rate how useful the conversation was on a scale of 1-5 (not useful – very useful) after completing it. They also recorded whether they had already discussed it earlier in the day. This allowed checking to see if conversations were not useful because they had already occurred, and allowed a measure of how commonly exchanges of mutually useful information naturally occur during shared tourist activities. The [Future⇦⇨Future] pairings (cases where both backpackers intended to travel to the same location, see Table 1), were de-emphasised in this iteration to focus on other types of pairings which backpackers thought were more useful.

As with the first study, a group discussion followed the exercise. Backpackers used their cards to remember the conversations they had and explained their ratings along with other discussion topics. One of the observers was Marketing Manager for the travel products company Lonely Planet and additional discussion topics concerning guidebooks were introduced at his request. Following the study, the backpackers were again given postcards to complete and return a week later.

BP3 - Name:

This card shows pairings between you and others in the group. Spend about 5 mins with each person you have been paired with and discuss the topic mentioned. Then switch to another person.

1 Talk to: About: what to do in Byron Bay

Did you already talk about this topic enough with someone on the trip today? ☐yes ☐no

After talking, how useful was this pairing to you? Not Useful ☐☐☐☐☐ Very Useful (Check only one box)

Have not talked about yet

2 Talk to: About: Sightseeing in Sydney

Did you already talk about this topic enough with someone on the trip today? ☐yes ☒no

After talking, how useful was this pairing to you? Not Useful ☐☐☐☐☒ Very Useful (Check only one box)

3 Talk to: About: Stop-over in New Zealand.

Did you already talk about this topic enough with someone on the trip today? ☐yes ☒no

After talking, how useful was this pairing to you? Not Useful ☒☐☐☐☐ Very Useful (Check only one box)

We had both been there already.

Figure 88: A pairing card given to a backpacker and completed during discussions with other backpackers they were paired with (names erased).

3.6.2 Results

Both studies had similar findings which identified pairing difficulties and determined patterns of successful matching. Changes in the second study allowed the opinions of backpackers to be tracked more effectively and focused on the types of pairing participants found useful. The results are shown consecutively below.

3.6.2.1 Social Pairing Exercise - Iteration 1

While working with the data from the participant questionnaires it became apparent that at least three types of pairings are possible (see Table 1).

Table 1: Types of social parings.		
A.	Past⇦⇨Past	Reliving old memories between people who have both been there or done that.
B.	Past⇨Future	Someone who has been to an intended destination giving advice to someone going there or doing that.
C.	Future⇦⇨Future	People who both have plans to go to the same place or do the same thing there.

Pairing A [Past⇦⇨Past] appears to be largely an entertainment association. Backpackers were able to discuss memorable things that had happened to them, but it did not really help them in their future travels. Pair 1 asked about the past experiences of Pair 3 to determine if they had made the right decision in not visiting a location along a route. They confirmed that the location was not desirable and felt better about the decision. It is likely that sharing mutual past experiences increases initial bonding before longer-term relationships form. This could result in lasting friendships or finding compatible people to travel with.

Pairing B [Past⇨Future] is both very useful and potentially problematic because it is not reciprocal. Backpackers commonly offered advice based on past experience for the benefit of others. However, there is the potential for abuse if a well travelled person is used extensively for advice without receiving anything in return. There is, however, potential for indirect reciprocity (Mohtashemi & Mui, 2003), where a backpacker would receive advice from different backpackers to those they were giving it to. Experienced backpackers would still give more than they take, but they would get some information in return. It is possible that experienced travellers may not mind being used because they gain friendships and social status in return for the gift. This is likely to produce a fleeting form of social capital (Wellman, 2001a).

Pairing C [Future⇦⇨Future] does not involve much information exchange, but it does potentially enable backpackers to rendezvous in the future. Backpackers frequently have flexible schedules that allow them to join up with others if they wish. However, backpackers often already know if others they meet are going to the same place and may only have an interest in meeting up with certain people. Thus, this may not be as useful a pairing for these users.

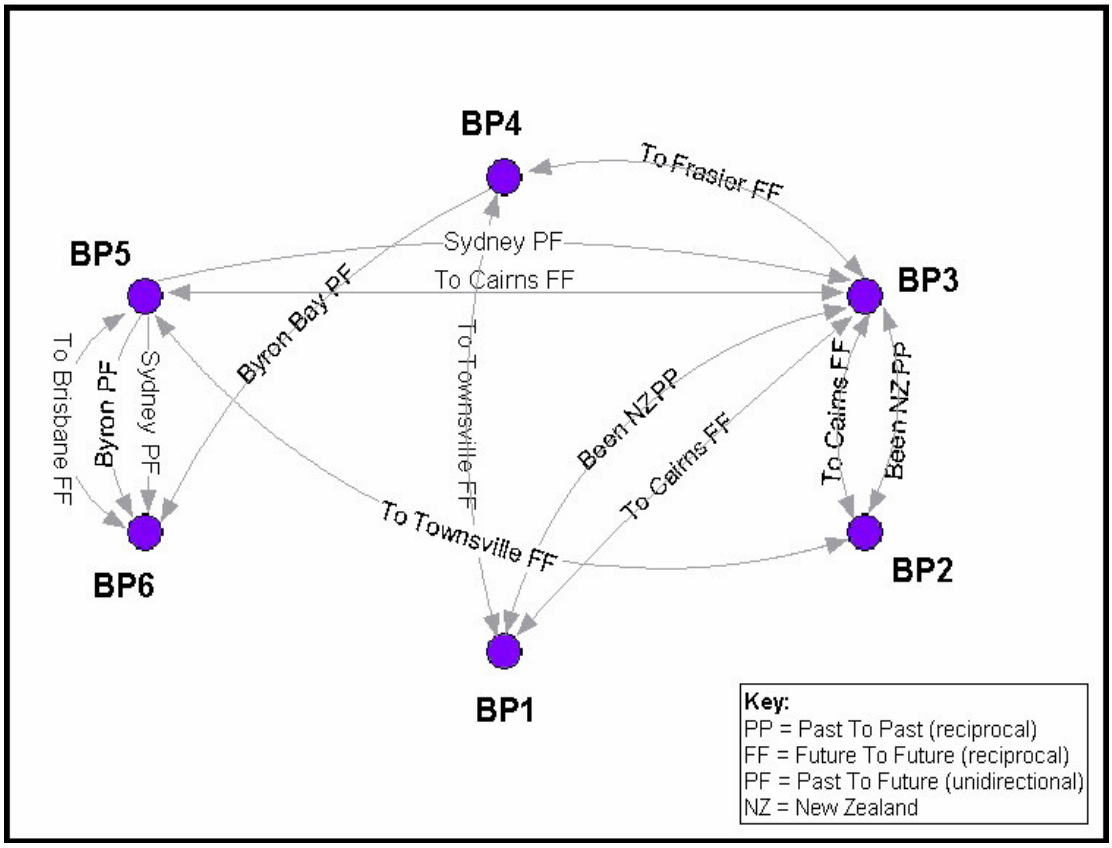


Figure 89: Pairings selected for backpackers in Workshop 1. Ties between travelling partners were not used in the study or shown above.

Pairings between participants that were identified by researchers are shown in the chart (see Figure 89). Some participants are hubs in the network (in particular see BP3 and BP5). BP3 has a large potential to share many experiences with others in the future, but does not give information away. BP5 has experience others want and is giving information away, but not receiving any in return.

The lack of functional prototypes did not hinder participants' ability to discuss or use the automated pairing system. The use of simple paper cards and the activity itself allowed participants to focus on the underlying *reasons they were using the system*, instead of the *interface to the system*. Backpackers were reasonably negative about

the utility of the pairings that we arranged for them. However, both observing pairing discussions and backpacker responses have provided information about how pairings should occur and where problems exist. Potential issues are as follows.

Some backpackers did not complete the whole questionnaire, resulting in less data. Also, some were travelling together, resulting in the same information for each person. The [Past⇦⇨Past] pairing worked well because backpackers could compare travel experiences and relive interesting moments. This was entertaining, but perhaps not very helpful for future travel. Few [Past⇨Future] pairings were possible, partially for the above reasons and because the group was small. The few pairings of this type were reported to be successful. For instance BP4 had spent time surfing in small towns around Byron Bay and BP6 wanted to go surfing in the area and appreciated the advice (see Figure 89). The [Future⇦⇨Future] pairings were the most common type arranged, and were a failure. Backpackers reported not having anything to talk about. We think this type of information could be useful for backpackers, but possibly not just after arriving in a city or while sitting in a research study. It also might be useful for occasional use when a backpacker meets someone particularly interesting or for people looking for travel partners. We concluded that the study should be run again, with increased detail of travel history, less emphasis on the [Future⇦⇨Future] pairings and more detailed tracking of opinions about individual pairings.

Three of the six postcards given to backpackers at the end of the study were returned between 7-20 days following the study. BP5 had gone to a club with BP4 following the study and contacted her by mobile phone to see how she was doing after leaving Brisbane. BP3 & BP1 had not contacted anyone other than their travelling partners. All three respondents were at different cities in Australia at the time of writing. Both of the travelling partners only submitted one card each and one single traveller (BP4) did not submit her card.

3.6.2.2 Social Pairing Exercise - Iteration 2

Analysis of the questionnaire data for the seven backpackers resulted in identification of 21 social pairings by researchers. Of these, 18 were actually discussed by participants due to time limitations or preference. Six out of 18 of the pairings had already been discussed during the prior field trip, while the remaining 12 had not yet been discussed.

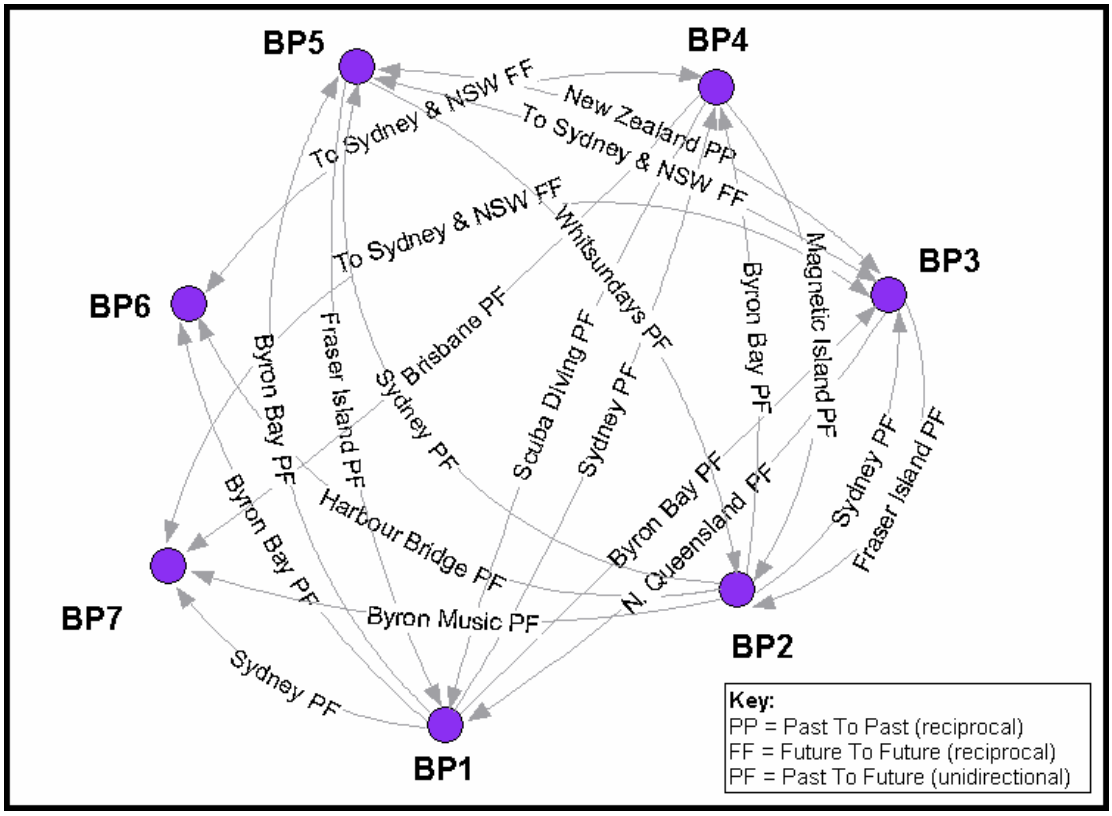


Figure 90: Pairings selected for backpackers in Workshop 2. Ties between travelling partners are not shown and not all ties made were discussed by backpackers.

Both the previously discussed topics and the new topics had a wide range of ratings from useful to not useful. This indicates that being able to talk more about a topic that had already been discussed did not change its perceived utility. BP1 & BP2 were the only backpackers travelling South to North, while the other five were headed South. This resulted in a bottleneck for pairing, with BP1 & BP2 as primary hubs in the network (see Figure 90), since they had most of the travel information that others would want. Information flow in social networks is analogous to whirlpools and waterspouts in the ocean. BP6 & BP7 are primarily information-pools; they take in a lot of advice but give little back, which is a classic social dilemma (Axelrod, 1997; Kollock, 1998). BP1 & BP2 are information-spouts; they receive some information, but give a lot of information out to other group members (see Figure 90).

The twelve [Past⇨Future] pairings rated by participants received high usefulness ratings; they had an average of 3.75 and four of these were considered “highly useful”. Three [Future⇦⇨Future] pairings were selected by experimenters and these again received very poor usefulness ratings from backpackers with an average of 1.3. The one [Past⇦⇨Past] pairing was rated a 1 (not-useful) and had a note scrawled next to it, “*we had both been there already.*”

Six bi-directional (reciprocal) [Past⇨Future] pairings were made (Figure 90: BP1⇦⇨BP3, BP1⇦⇨BP5, BP1⇦⇨BP4, BP2⇦⇨BP3, BP2⇦⇨BP4, BP2⇦⇨BP5). This occurs where the uni-directional pairing happens both ways for different topics. For example, BP3 knew about tours on Fraser Island where BP2 was going, and BP2 knew about sightseeing in Sydney where BP3 was going. Of the 21 total pairings, 12 of the [Past⇨Future] pairings resulted in forming reciprocal relationships.

The construction of the social pairings 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 had each listed five past locations, five future locations and five travel-related questions that they would like answers for. For the case of [Past⇨Future] pairings, any backpacker's five past locations could be associated with the other 60 future locations and travel questions of the other backpackers. This resulted in a theoretical upper bound of 300 bi-directional connections. There would be even 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 researcher. The pairing process first identified all past locations and allowed rapid scanning of matches from the future or question sections.

An added complication is that pairings contain cultural, geographical and semantic information. For instance, a researcher looking to make a pairing for a backpacker interested in scuba diving, would need to know which Australian coastal locations 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 pairing with strangers would be likely to increase diversity of corresponding travel information and expected utility of pairings.

Locating enough [Past⇨Future] and [Past⇦⇨Past] pairings was difficult and three [Future⇦⇨Future] pairings had to be chosen. 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 (e.g. dive sites). One

researcher commented that doing the pairing felt like an algorithmic process and that it should be automated.

Five of the seven postcards were returned between 3-8 days following the activity. BP3 had briefly chatted with BP1 & BP2 in the kitchen of the hostel following the study and with her travelling partner BP4. BP4 indicated the same discussions on his card. BP6 had talked with her travelling partners BP5 & BP7. Coincidentally they had travelled the same route (Brisbane-Byron Bay-Sydney) as BP3 & BP4, but a week apart. BP5 & BP7s' cards confirmed BP6's account of the travels. The travelling pair BP1 & BP2 did not return their cards and were travelling in the opposite direction.

3.6.3 Discussion

Running the social pairing activities led to a number of conclusions about where they are useful, how they should be structured, and what implications our experiences had for general UCD practice. These topics are discussed in the following sections.

3.6.3.1 Using Contextual Workshops To Simulate Pairing Systems

The pairing exercise is intended to probe the utility of automated matchmaking systems for mobile communities. We had the option of creating a high-fidelity prototype of a pairing system on mobile phones and testing it with backpackers. However, it would have introduced variables such as specific technologies used, ergonomics, and technical and usability problems. This would have changed the focus of backpacker input towards technology issues, which was not the focus of the investigation. Instead we used very low-fidelity methods.

Participants in the studies both used and enacted the low-fidelity prototype of the pairing system. In this case, the "system" was not computerised, nor did it have a physical interface. It was a conceptual design, which had certain rules for interaction with it (e.g. ask a travel question of your partner), and certain results as a consequence of using it (e.g. the advice received). When viewed from the perspective of ubiquitous computing, this is an interface-agnostic simulation. Participants spoke and used pieces of paper to interact with the system, which are so familiar as to be practically invisible for them. This meant that the users naturally focused on the underlying social issues and the utility of the information they were getting, instead of interface interaction issues. This is useful when attempting to determine what a product should do, before determining how it should be constructed to enable users to reach those ends.

A related issue is where participants (probable future users) can most effectively be involved during a development process. In this study participants did not design a physical interface; furthermore, we would not request that they do so, as they are not trained designers. However, the participants were able to provide excellent qualitative feedback on the design that they used. For example, during the discussion period following the pairings, one backpacker made an illuminating remark. She said that using the pairing system “felt too formal”. We as designers had built a logical pairing system with a fairly rigid structure without much thought as to what it would feel like to use. A backpacker trying a very simple version of our design had already found a serious design flaw relating to the social context in which it is used. In a similar fashion, all of the backpackers’ participation was most useful for *understanding user requirements* for the system and *evaluating design concepts*. Thus, the backpackers beneficially participated in the larger design process (or development process) from within their own area of expertise: travel.

While designing the workshops, we were attempting to find a way to make them as in-situ as possible. The hostel was a typical environment, but we also wanted participants to be in a mobile context while they were considering the implications of mobility. It appeared impractical to actually hold the workshop while moving and the hostel represented a short pause in a larger pattern of regular movement. The activity itself also engaged backpackers in considering past and future movement and discussing this with others. Thus the design of the activity is perhaps not as contextually accurate as it could be, but is probably sufficient for the situation.

Most of the pairings made in the activity were based around location. This was primarily because of the correlation between past locations and travel knowledge, but it was also the primary focus of our questionnaires. Other types of pairings would be possible. For instance, activity pairings may be as important as location pairings. For example if BP1 and BP2 both like scuba diving, then they may wish to compare notes on diving sites regardless of whether they have been, or intend to go to the same place.

Our studies did not address realistic conversational openings, or “breaking the ice” as it is more colloquially called. We simply requested that backpackers talk about a certain topic with others they had previously met. This is not representative of strangers needing an excuse to talk to someone without direction by an authority figure. It remains an area for future research to explore what pairings will actually

convince people to chat with strangers, and in what circumstances. Physically locating paired strangers in different social environments is also an area of interest.

3.6.3.2 Toying With Travellers and Social Responsibility

The possible implications of wide-spread MoSoSo usage are significant. For example, consider a backpacker who gets recommendations on people (who to talk with, date, trust), places (which locations are safe, fun, cheap), things (which products are cheap, quality, effective) and broader social issues (political news, history, culture). This information is provided by a trusted system, which represents a trusted social network of other travellers in a similar social situation. What impact will design changes to such a tourist recommendation system have on the behaviour of its users?

A recommendation promoting travel to a remote Asian country might corrupt native traditions when large numbers of tourists arrive. An effective service promoting dating might result in an increase in STD rates. These high-tech quandaries are similar to those which guidebook manufacturers have long faced in a low-tech medium. However, if these systems are designed in a centralised manner, then someone (most likely a business) will be playing god with their users. Moral and ethical behaviour will be greatly influenced by the system designers who will restrict and encourage those activities they wish to; this is already commonplace in web-based communities (Bretzke & Vassileva, 2003; Duff, 2005). Thus, a challenge for those using participatory methods to develop MoSoSo systems is to find a way for the community to set their own standards for the technologies they have helped design.

A key design challenge for backpacker MoSoSo relates to the need for a reputation system. Social capital forms very quickly amongst backpackers and often dissipates just as rapidly (see Sections 2.1.3 and 2.5.5). Hostels gain reputations since they stay in the same location and retain the same name; however backpackers move on and rarely gain reputations among others for long. This means that good reputations disappear just as rapidly as bad ones and give little incentive for good behaviour (as defined by the larger community). It seems likely that a non-location-based reputation system would increase community awareness of model members. Resnick has discussed similar issues concerning impersonal sociotechnical capital (Resnick, 2004).

The results section of MIS (see Section 3.5) also notes that there are design issues relating to distributing the responsibility of information exchange and dealing with

information-pools. The backpacker social network has highly dynamic physical movement and information content.

To pose a hypothetical example: a backpacker travelling North⇨South might meet a group travelling South⇨North and be overwhelmed with questions, thus forming an information-spout in the network. One member of the South⇨North group may have only been travelling for a week and have very little to offer, forming an information-pool. However, this novice backpacker rapidly gains experience and information from others. In another week the former novice may form an information-spout for other new travellers. This results in the development of a social norm amongst a community with transitory membership. If a novice backpacker gets help from others when they are starting, they are likely to perpetuate this action to others. It is probable that this information-sharing system is already self-regulating in the offline medium; however it is not clear how to transfer the natural physical and social boundaries regulating information flow into the online community space.

3.6.4 Summary

There is a new world emerging based around mobile social networks and the increasingly advanced technologies used to facilitate and mediate them. We have presented two studies of a low-fidelity prototype of a social pairing system for backpackers. Graphs of the pairings showed backpackers who were hubs in the network of travel information and the clear effect of travel direction on information utility. Practical usage of the social network pairing activity and broader societal implications of pairing system usage are discussed. The studies show the importance of including users in early stages of requirements analysis and development.

3.6.4.1 Summary Of Requirements For Social Pairing Systems

- Please see Appendix B.3 for a list of requirements.

3.7 Research Study: Contextual Postcards

Understanding requirements of mobile communities is challenging because of their geographical distribution and frequent movement. The previous studies looked at collocated backpackers who were contacted in person. However, there was a need to investigate the requirements of backpackers who were not in Brisbane and had not

met each other. The following study of backpackers travelling in Australia utilised a research method called contextual postcards. The method uses brief, open-ended questions to solicit contextual responses from backpackers. These responses are relevant for development of tourism and mobile communication technologies for this user population.

800 postcards were distributed via hostels and a travel agent, questioning travellers about their current situation. Questions asked how they had heard about their present location, what kinds of virtual-graffiti they would leave there, and what their greatest worry currently was, among others. Results indicated that backpackers have a great deal of practical and serious concerns to contend with as they travel. They are physically cut off from family and friends and rely on a range of communications media to stay in touch and exchange emotional support. They have a great deal of practical travel experience that would be useful to other travellers, but which is currently only conveyed haphazardly via word-of-mouth. Practical usage of the contextual postcards is discussed and design recommendations for mobile group products are offered. The following sections cover the method, results, analysis techniques used, and discussion of the results.

3.7.1 Method

The Contextual Postcard study was intended to canvas backpackers in a range of Australian cities and to determine design issues relevant for a mobile travel assistant. A primary research goal was to determine relevant usage situations and use these to elicit design problems that are situated in terms of what backpackers were experiencing at the time. Backpackers move rapidly, and consequently research methods that are mobile and distributed are often most appropriate.

The contextual postcards are most similar to questionnaires because they use a pre-determined set of questions and offer some potential for quantitative analysis. They are also like diary studies because they ask respondents to self-report on a particular situated phenomena. They are also similar to cultural probes in that respondents are given the postcards and then choose what to share from their lives. They also encourage diverse and playful or creative responses.

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

Short questionnaires with open-ended design questions (see Table 2) were printed on 700 postcards, which were distributed to seven Australian backpacker hostels. Two hostels were in Brisbane, two in Sydney, and one each in Adelaide, Melbourne and Cairns. These hostels were selected from a group of 13 well known hostels. Hostels were originally contacted by e-mail to determine if they were interested in supporting the study. Those who responded positively were sent a package of 100 postcards and instructions on how to distribute them. Hostel staff were requested to hand out one postcard to each incoming guest, until all postcards had been used.

They were also given an information sheet outlining the purpose of the study. Backpackers were requested by staff to fill out the postcard where they wished and place it in any post box for free delivery back to the researchers.

After this phase of the study was completed, an additional 100 postcards were sent to a Melbourne travel agency which has a large backpacker clientele. At this location, the travel agents distributed the cards directly to backpacking customers.

3.7.1.1 Postcards and Questions

The postcards are roughly business size (21 X 10cm) and were post-paid; meaning that backpackers did not need to purchase stamps, and the researchers were only charged for returned cards. The front of the cards contained a description of the study, instructions on using the postcard and contact information for the study organisers (see Figure 91). The reverse side contained seven brief questions and a code indicating the card version and hostel number (see Figure 92). Four of these were the same on all cards and concerned current city, current place, gender, and travelling alone or in a group.

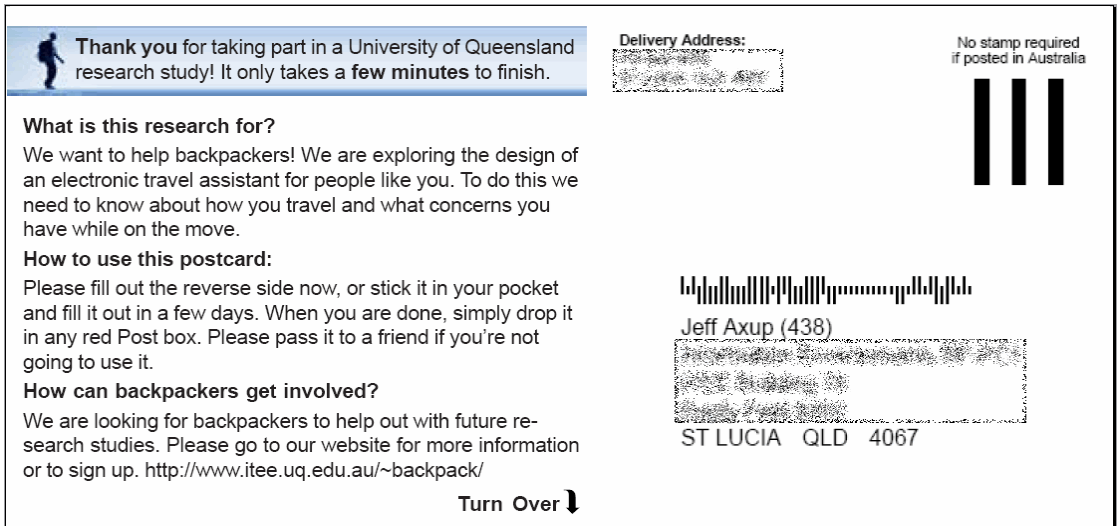


Figure 91: Front of postcard with instructions and mailing address.

Where are you now? City:	Place: (e.g. cafe, bus)	Gender: ☐F ☐M Travelling with someone? ☐Yes ☐No
How did you find out about your present location before you decided to come here?	Think back to the last group of strangers you talked to. How did you meet and what did you do with them?	If you could have any travel question answered for you, what would it be?

A-10

Figure 92: Back of postcard with questions for travellers.

The remaining three questions on each card were designed to elicit free-form feedback. Nine questions were used in total, with three questions assigned to each of three card versions. The three card types were evenly distributed at each hostel. The postcards were designed to be brief and simple to complete in order to increase response rates. The questions focused on prompting backpackers' situated responses to relevant design issues. It was expected that postcards would be completed in a variety of locations and that the respondents' context might affect their answers. Consequently the questions asked about present location and what current travel issues were being experienced. The forms were similar to cultural probes in that participants chose which details to divulge to researchers about their personal lives and were done in a natural travel environment.

3.7.2 Results

The response rate for the initial phase, 16 of 700 cards (2%), was extremely low. Eight respondents were female and eight male. Most respondents completed the postcards at their hostel, although it is not clear where in the hostel. One filled it out in her room and another in the hostel foyer. Another completed it on the street in front of the post box. Seven of the respondents were travelling with someone. This is in proportion with findings from other surveys of backpackers in Australia (*Backpackers Uncovered,* 2003; Ballen, 2004). Responses were reasonably distributed across the

three types of cards. Answers tended to refer to recent events the backpackers had experienced, current issues they were thinking about, and tended to be light hearted.

The second phase resulted in a better return rate. So far, 18 of an unknown number of the 100 cards distributed have been returned. The returned cards are slightly weighted towards version C, (A=6, B=4, C=8). Unbeknownst to us, the travel agents initially requested backpackers to complete the cards in the travel agency and mail them via that location. While a travel agency is not an unrepresentative location for backpackers to answer the questions, we believe it has affected the results. Responses in this phase have been much more reserved and practical. They have also tended to be oriented towards travel planning issues, which were presumably discussed with the travel agent around the time that the card was distributed and completed.

The responses are listed below, organised by the postcard question topics which backpackers were responding to. For each postcard question, the two phases of the study are discussed in order.

3.7.2.1 Finding Out About Locations Beforehand - Version A

Phase 1: Several of the respondents indicated that they had heard about their location from a guidebook. "*Lonely planet said it was a good party place*." Several backpackers cited a different location as the source of their information, implying that they had talked to others while there about their present location. One respondent wrote "*Kings Cross, full of smut & porn shows, nuff said!*"[25], implying that there is common knowledge amongst travellers about various locations.

Phase 2: Backpackers took this to mean both the travel agent as well as the city. One indicated that they had heard about the travel agent on their web site, while another that he had come to the city to play cricket. One backpacker was using a formal job placement service for backpackers which had directed them to the city for work.

3.7.2.2 Meeting Strangers - Version A

Phase 1: Respondents reported meeting other people through shared activities and locations. A bar, a bus stop, on a bus, and in shared hostel room were given as

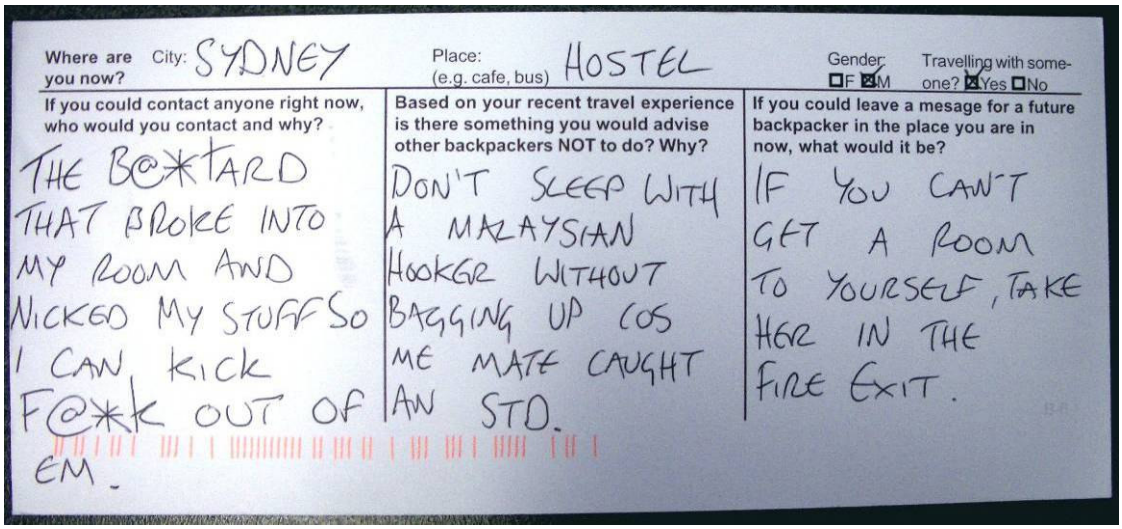
[25] All quotes show original spelling used by respondents.

locations which fostered meeting strangers. One said, "*[I] met a girl at Darwin shuttle bus. Started chatting, then spent the next 3 days with her in Alice Springs.*" These meetings resulted in talking, going to a footy (rugby) game, travelling together, playing games, and smoking together. Of these activities, most would commonly be frequented by other travellers with the exception of the bar.

Phase 2: Several backpackers mentioned meeting others in the hostel kitchen and other common areas. "*In the hostel Kitchen! I needed some pepper… Will go out to a pub tonight.*" Others discussed meeting people through temporary work and meeting others staying at the same hostel. Several respondents mentioned discussing work, travel experiences and shared food, alcohol or games.

3.7.2.3 Travel Questions - Version A

Phase 1: Travel questions ranged from jokes by the respondent "*Will I regret (when I get home) having shagged so many people bcs it does not matter when you're travelling.*" to serious requests, "*How do I avoid back pain?*" One person used this question to start thinking about potential guidebook features. They proposed a map showing "*dodgy or unsafe areas of cities*" that would be available on a PDA.
Phase 2: Backpackers had several practical concerns. They wanted to know how to get taxes refunded from their work and another suspected sexist hiring practices. "*Why is it too hard for female backpackers to get a proper job over here? Why do they announce they have 1000 jobs and then still want locals?*" Others wanted to know where good, cheap hostels were and nice places to visit in broad locations where they were going. "*Where is the nicest place in WA near Perth?*"


Where are you now? City: SYDNEY Place: (e.g. cafe, bus) HOSTEL Gender: ☐F ☒M Travelling with someone? ☒Yes ☐No

If you could contact anyone right now, who would you contact and why?
THE B@*TARD THAT BROKE INTO MY ROOM AND NICKED MY STUFF SO I CAN KICK F@*K OUT OF EM.

Based on your recent travel experience is there something you would advise other backpackers NOT to do? Why?
DON'T SLEEP WITH A MALAYSIAN HOOKER WITHOUT BAGGING UP COS ME MATE CAUGHT AN STD.

If you could leave a mesage for a future backpacker in the place you are in now, what would it be?
IF YOU CAN'T GET A ROOM TO YOURSELF, TAKE HER IN THE FIRE EXIT.

Figure 93: A response from a backpacker that both has a jovial tone and discusses serious issues.

3.7.2.4 Ability To Contact Anyone - Version B

Phase 1: Respondents wanted to talk to people that either they had strong emotional feelings towards or organisational reasons to contact. One backpacker wanted to contact the "*ba*tard that broke into my room and nicked my stuff*" (see Figure 93) while another wanted to make a complaint to the hostel organization about the advertising policies. Another wanted to arrange travel plans with a friend in a different city. These answers seemed to be highly dependent on events backpackers had recently experienced or issues they were dealing with at the time.

Phase 2: This question produced varied responses. Some backpackers expressed a desire to contact a boyfriend or best friend at home that they were missing. "*Best friend. Have not talked to her for a while because it is so expensive. Miss her terribly!*" Another more serious comment said "*I would probably contact work and Travel Company, which is the company that I'm travelling with. They have an emergency hotline I can call to. But it depends on what situation.*" However, it was not clear why there was an emergency.

3.7.2.5 Advice For Other Backpackers - Version B

Phase 1: This question received a number of serious responses. They gave advice on travel planning, "*Do NOT book anything from home. It is so much better to be able to be flexible and change plans depending on who you meet.*" and some discouraged

travelling with others. One backpacker advised using condoms with prostitutes after a recent STD experience. Another traveller encouraged others to avoid dangerous townships and another advised researching public transit before booking tours. This advice tended to be practical and often related to safety issues.

Phase 2: One backpacker advised others not to arrive without accommodation booked to avoid carrying bags unnecessarily. Another vehemently advised others on travel routes in the outback (this area is known for its dangerous single-lane highways). "*Do NOT go from Alice Springs to QLD via Plenty Highway in an ordinary campervan!!! I do not recommend driving the whole way to Alice Rock to see it, it was not worth it.*" Others made practical recommendations about not planning ahead too much and not spending travel funds too early in the trip.

3.7.2.6 Graffiti For Other Backpackers - Version B

Phase 1: Answers to this question had a different tone and tended to be in the form of broad advice on life or travelling. One said "*You only regret what you do not do, so live it up and have the time of your life.*" Practical advice included a hostel recommendation, "*Come here! Great, clean, services very good, right in centre of great city. All facilities great and many travelling here to meet. Staff wonderful and understanding and obliging.*", and more advice on taking tours.

Phase 2: Answers tended to be more practical than phase 1, but there were still some answers giving broad advice. "*Rock on, enjoy your time. It'll be the best time of your life mate.*" Other responses mentioned locations that should not be missed and this issue of travel funds was mentioned again. "*Have plenty of money for the trip. You spend more money than you've planned to. You do not wanna travel the world around an not be able to spend any money on things you want to do.*"

3.7.2.7 Information About This City - Version C

Phase 1: Questions about the current travelling situation tended to be utilitarian. One wanted to know how to hire vehicles "*Hiring motor homes! 4-berth and cheaply!*", while another wanted to know about public transport to nearby tourist locations. Other backpackers wanted clubs with desirable females or certain styles of music.

Phase 2: One backpacker expressed an interest in learning more about the history of the city he was in and another wanted a better understanding of Australian culture.

Other respondents wanted to know about day trips, locations of good bars, and current cultural and sporting events.

3.7.2.8 Last Person Contacted - Version C

Phase 1: Responses were split between family and friends. Family was contacted "*to keep in touch*" or "*let them know we arrived.*" Friends were contacted about plans to meet up. One sent an "*SMS to meet up in Fremantle*" and the other had contacted "*My mate [John] by SMS to see if he's bringing 2 fit girls with him to Byron.*" These answers indicate a need to keep others informed of current events and to coordinate future events. Both SMS and payphones were mentioned as communication technologies.

Phase 2: This resulted in a range of responses reflecting the diversity of conversational topics. E-mail was most common, but communication media ranged from mobile phone voice calls, to text messaging, online chat and payphones. Some called friends, mothers or sisters to give them updates. "*I wrote my sister an e-mail because she miss me. I wrote her informations about my situation, my problems and my job. Email is a good device to keep in touch.*" Others used multiple methods of talking to close friends and several discussed arranging future meetings. "*Mobile, chat, e-mail. I contact my friend in Taiwan. I hope they can join me to travel.*"

3.7.2.9 Greatest Concern or Worry - Version C

Phase 1: Several backpackers mentioned money—either spending too much of it or running out of it—and time limitations. One was worried about "*Catching buses or planes on time because I try to cram in too much.*" Employment, sexually transmitted diseases, TV programming and travel planning were also topics of concern.
Phase 2: Backpackers had a number of practical concerns they were dealing with. Several wanted to find work and a few seemed desperate to do so. "*At the moment, we are waiting for a job call, because we've no money and money is a necessity when travelling.*" Others were concerned about losing possessions, making friends, storing digital camera photographs and searching for a temporary flat to rent. Another was concerned about the political situation in a future travel location. "*I'm mostly concerned about getting back and set in the hostel in Thailand, b/c of their atrocities.*"

3.7.3 Discussion

Some of the light-hearted responses show that some of the questions that backpackers are concerned with are somewhat philosophical. These concerns are probably related to exploration of a given life stage as has been reported elsewhere (Richards & Wilson, 2004). Several of the respondents replied with jokes indicating they were not really taking life seriously in general, or at the time they filled out the postcard. This is to be expected as many of them are on extended vacations.

Many of the responses did deal with important issues which would be beneficial for the backpacker community to have greater awareness of. However, some discussion topics might be uncomfortable for certain parties (e.g. hostels or tourism agencies) to support. Examples included discussions of prostitution, dating, and negative reviews of tour offerings or hostels. It is likely that backpackers will want to, and probably need to be able to discuss these topics. It is likely that technological facilitation of these types of conversations will have societal impact.

Due to the low response rate in phase 1, all seven hostels were contacted with a follow-up e-mail asking about the distribution of the postcards, and one respondent who gave contact information was also contacted. Of the two hostels that replied, the issues of: lack of hostel staff remuneration and general apathy by backpackers was given. One also admitted to placing the stack of flyers on a counter. The backpacker we contacted indicated that he had never been handed a flyer when he checked in, but had picked it up from a stack sitting in a pile amongst other flyers.

The sample size for the study is far less than required by standard questionnaire studies and is insufficient for statistical analysis. However, the methodology used is similar to cultural probes and contextual interviews, which traditionally use small sample sizes. We have briefly sampled the opinions of 34 people in our target user group who at the time were experiencing issues relevant to our design. The total cost of materials and postage for the study was about $60 (USD). The respondents have provided personal details which are often difficult to obtain and surprised us with some of their activities and needs. More responses would have made rapid analysis difficult and probably would have produced similar data. The results have proven sufficiently useful to guide early product design and understand more requirements of backpackers.

The effect of having the postcards in phase 2 completed and mailed at the travel agent is hard to gauge. The responses are probably affected by the uniformity of the environment, activities typically engaged in there, and authority figures present. However, we also received a much better response rate in this setting. Thus there may be a trade-off between less-controlled settings and reasonable response rates. The lack of control over distribution processes may necessitate the need to distribute via multiple mechanisms.

3.7.3.1 Resulting Product Design Recommendations

Please see Appendix A.3 for a list of design recommendations.

3.7.4 Summary

A new method called *contextual postcards* has been described which helps facilitate design research with distributed mobile groups. This method uses short open-ended questions which query respondents about their interaction with, and feelings about, their current environments and situations. The method was developed to help understand the needs and behaviour of backpackers in Australia. Backpackers' travel habits and movements make it challenging to contact them at different stages of their journeys. A trial of this method resulted in far fewer responses than expected, and we have determined methodological and social reasons for this. Despite the low return-rate, the answers were of high quality for informing design requirements.

3.8 Research Study: Electronic and Paper Travel Diaries

A variety of methods have been used in the doctoral research to triangulate on better requirements for backpackers and stimulate new design ideas. Continuing a trend starting with the contextual postcard study (see Section 3.7), the diary study in part looked at the high-level behaviour of groups and communities of backpackers. However it also retained the ability to examine the daily perceptions of backpackers and see how these resulted in the emergence of community behaviour. The study was able to do this by using various kinds of diaries. Paper diaries were used to explore recording desired research data while moving, and electronic travel diaries (travel blogs) showed post-hoc accounts of both individual and collective behaviour.

Travel blogs, which backpackers use to post photographs and textual accounts of their journeys, provide large quantities of data suitable for informing design. 4677 photographs from 233 backpackers were analysed to look at how backpackers were visually recording their travels and what usage situations they found themselves in. A selection of textual blog entries was also reviewed, and typical or difficult situations relevant to design have been illustrated with blog excerpts. Additionally, paper diaries and a database of 8073 blog entries were used to generate graphs which depict personal and community behaviour.

This section discusses what backpackers do, challenging and mundane situations they encounter, the visual recording of travel, and how communities form and act. This is followed by a discussion of what backpackers want to be able to do, how cameras affect travel, and methodological considerations for using travel blogs to inform design.

3.8.1 Method

An iterative research process was used which began with paper diaries, then moved to a review of online diaries (blogs) and eventually resulted in quantitative analysis of a database of blog entries. This made it possible to try methods with a new user population, determine what was not successful, and refine methods to improve results or investigate new topics of interest. The studies had two goals: one was to determine how design requirements could be generated from diary data, and the second was to investigate the structure of the backpacking community and see how they were using blogs.

3.8.1.1 Use Of Paper Diaries

Initially a study design similar to traditional diary studies was chosen. One backpacker travelling alone, and a pair of backpackers travelling together, were each given a paper journal to record their travels and people they met. They were also given pre-stamped envelopes to return the journals with. The diary contained laminated instructions for returning the journal and an example diary entry (see Appendix O). The example showed section labels for ‘date’, ‘location’, ‘people met’, ‘people travelling with’, ‘people I communicated with today’, ‘relationship to these people’, and ‘information discussed today’. Participants were requested to use the sample entry as a guide, but were also told they could use the diary as they wished. In the event of personal and valued information being entered, we offered to return

the original to them after transcription. The diaries were specifically intended to help the researchers understand more about the social pairings of backpackers. The participants were backpackers selected from those who had previously taken part in contextual interviews and appeared responsible and interested.

One of these diaries was used to form a variety of different social network diagrams showing people, locations and activities. The diagrams show summary views of backpacker social networks after a period of travel, the relationships between people and activities, and different levels of physical context over time. One of these charts has been animated to show growth of a social network over time. The diaries were also used to develop a physical context chart depicting a travel route and vignettes (Button, 1993) suitable for informing design processes. The diagrams are generated as a proof of concept of how diaries and community behaviour can be visualised. I am also exploring graphing the relationships between location and social ties, and movement of information within ad-hoc groups. Some of the diagrams are shown in the results section below (See Figure 98, Figure 99, Figure 102, Figure 103, Figure 104).

3.8.1.2 Use Of Travel Blogs

A separate portion of the study reviewed travel blogs which recorded pictures and narrative accounts of backpackers travelling over long periods (up to several years.) Several traditional blogs which had been used to document travel were reviewed, and 4677 photographs used in the travel blogs of 373 backpackers[26] were reviewed. The photographs were gathered using a web spider which recreates public site structure remotely. Anonymity of the photographers was ensured because the structure of the data did not allow determination of which blogs individual photographs originated from. There were an average of 12.5 photographs posted for each blog, but some blogs did not include photographs, and some included many more.

A taxonomy of photographs based on the type of activity was developed in order to help understand more about backpacker behaviour for the purpose of informing the design of a mobile device. Important categories which emerged from review of the data were based around whether photographs had people in them (category: people)

[26] These blogs are hosted by www.getjealous.com.

or did not (category: non-people). Within the people category, posture seemed relevant to activity, and whether the activity occurred inside, outside or on transport clearly influenced what was being done. Photographs in the non-people category differed largely based on whether they pictured large environmental settings (category: large) or smaller environments or settings such as houses or objects (category: small).

In accordance with the above taxonomy, a random sample of 1500 of the photographs with people in them were categorised into the following postures: climbing, kneeling, lying down, running, sitting, standing, swimming, walking and unclear. Each category was subdivided into inside, outside, and transport, and each photo only matched one category. photographs containing elements of more than one category were judged based on the more dominant category pictured.

In addition to categorisation and quantitative analysis as above, the photographs were also reviewed in a qualitative fashion. The following themes emerged both from prior areas of interest and during data analysis, and helped to form an understanding of the data set:

- types of transportation and activities afforded within them,
- activities and environments in photographs of groups,
- challenging situations (either for backpackers or technologies),
- inferred goals of backpackers, and
- objects of interest.

An additional phase of the study used a database of 8073 blog entries from trips in Australia, which was provided by TravelPod, a travel blogging service[27]. Database fields pertaining to date and location were used to produce another database of verified locations and social tie data. This data, which encompassed 1149 users and 1282 trips from 1970 to present day (some older trip journals have been transcribed), was used to produce a graph showing the anonymised travel behaviour of the TravelPod community in Australia (see Figure 103). Portions of several blogs were

[27] www.travelpod.com

reviewed, and the author of one exceptionally long trip spanning 3 years was interviewed by e-mail.

Data has been used from a variety of different sources. This is both for practical reasons such as access to data, but also to provide diverse perspectives across a wide range of backpackers, travelling styles and recording technologies. The paper journals focused more on the people who backpackers met while travelling. The travel blogs allowed users more choice of content and facilitated accurate recording of travel locations and time stamping. Blogs represent an extremely large data set which either requires automated analysis or the extraction of a subset for detailed analysis. Both alternatives have been used in this study to gain a better understanding of backpackers' behaviour and how they choose to record it.

3.8.2 Results

This section reports on themes that arose during analysis of blog entries, photographs, and graphs generated from the diaries backpackers kept while travelling. The section begins by discussing what activities backpackers do and the challenging and mundane situations they experience. This is followed by a review of how individuals choose to visually record their travels. Lastly, we look at the backpacker community: how it behaves, how social networks form and how information flows within it.

3.8.2.1 What Backpackers Do

Backpackers are often differentiated from other types of travellers or tourists based on the adventuresome and unusual activities they seek out (Loker-Murphy & Pearce, 1995). Despite this, backpackers do engage in many of the same activities as other tourists, such as visiting scenic or significant sites. Consequently, travel blogs document a wide range of different activities ranging from running with the bulls in Spain to sitting on beaches in Australia. From a design perspective it is more important to look at particularly challenging activities and mundane situations which backpackers regularly experience (Cederman-Haysom & Brereton, 2004). The former test the limits of what the design will need to handle, and the latter determine situations which will see heavy use. These topics are covered in the following sections (see Section 3.8.2.2, Section 3.8.2.3). What backpackers do, and what they *want to do*, may be different things. The latter topic is covered later (see Section

3.8.3.1) and is important because it offers insight into how technologies should integrate with existing circumstances to enable new activities.

Photos showed backpackers undertaking a wide variety of activities in a large number of locations around the world. There were 2182 photographs (47%) which did not contain people, and 2459 (53%) that did. Of the 1500 photographs selected as a sample of all of the photographs with people, 54% were taken outside, 35% inside, and 10% on transport (see Table 3). This shows a heavy focus on reporting outdoor activities and how dedicated backpackers are to reporting their experiences (also see supporting evidence from interviews: Sections 3.4.2.5, 3.4.2.15, and MIS: Sections 3.5.2.4, 3.5.2.11). Activities ranged widely and categorisation may be less useful than providing an understanding of typical usage situations. Common outdoor activities included: participating in organised sports, hiking in remote areas, camping, swimming or water sports, attending festivals, walking around cities, participating in local customs and visiting attractions. Common indoor activities included drinking in groups, dancing in clubs, attending parties, and watching sports.

Table 3: Types of photographs With People

Type	**inside**	**outside**	**transport**	**TOTAL**
sitting	12%	8%	8%	28%
standing	21%	37%	2%	60%
walking	0%	2%	0%	2%
running	0%	1%	0%	1%
climbing	0%	0%	0%	0%
kneeling	0%	1%	0%	1%
lying down	1%	1%	0%	2%
TOTAL	35%	54%	10%	

(Totals do not match data due to rounding)

Figure 94: Photographs showing outdoor travel scenes.[28]

Figure 95: Photographs showing indoor travel scenes.

One of the aims of the study was to understand how mobile devices might be used by backpackers in typical situations. Posture of the individual and stability of the surrounding environment are important factors affecting device usage (Brewster, 2002). 88% of the photographs pictured people standing or sitting, with nearly 2/3 of these standing. Clearly standing and sitting are common positions while being photographed. It should be noted that the medium being used to record the activity (i.e. the camera) affects how people are pictured. For example, photographs of people standing often actually denote a pause in walking, running or climbing. Standing was frequently done both inside and outside, as was sitting. Sitting outside and on transport often offers less stability than inside environments, with the exception of busy public indoor areas such as bars. This influences whether people can set down devices or interact with them in more stable positions.

Of the photographs with people, 35% depicted groups, as defined by the sociological definition of three or more people. This is a conservative definition for a number of reasons; someone usually takes the photo who is not pictured; photographs of

[28] Photographs originate from blogs maintained by getjealous.com.

individuals in groups are often taken and not counted here; and pairs of backpackers often travel together in a group-like fashion. It is likely that the incidence of groups of people being photographed is higher than indicated here. In any case, group travel is prevalent and the subject of many recorded memories. A list of a random sample of 100 group activities has been included (see Appendix Q).

Backpackers move frequently, and accordingly many of their photographs document transportation. A full list of transportation depicted is included (see Appendix P). Common transportation systems shown include: pickup trucks, passenger boats/ferries, airplanes, motorcycles, sailboats, cars, horses, elephants, busses, trains and parachutes (for examples see Figure 96).

Figure 96: Transportation varies widely depending on location.

Just under half (47%) of all photographs did not include people. Common subject matter for these photographs included:

- outside of buildings or structures (e.g. temple in Angkor Wat, bridge),
- inside of buildings or structures (e.g. mural on a ceiling of a church)
- objects of interest (e.g. a Tibetan prayer wheel, signpost),
- a scenic location (e.g. beach, valley),
- geographical features (e.g. stone arch, waterfall),
- the sky (e.g. sunset, clouds), and
- animals (e.g. monkey, fish).

Figure 97: Large-scale environmental photographs help convey the context of a situation to remote readers.

These categories are not exclusive or comprehensive, and many photographs incorporate multiple aspects. 75% of the environment photographs depicted big outside environments, falling under the description of large locations or settings. It should be noted that many larger scale urban environments were categorised as people photographs because they necessarily captured people in these environments. Thus the number of environment photographs is a conservative estimate. Objects (non-human, smaller than a house and the primary focus of the photograph) represented 14% of the non-people photographs. This is described further in Section 3.8.2.4.

Textual blog entries are too diverse and specific to generalise easily. They often seek to explain the pictures that accompany them, or to explain-situations and memorable moments during that time period. The sequential location chart (see Figure 98) shows some of the day-to-day detail of a traveller's life. The left column shows the a graph of the evolving social relationships and the right column shows the social and activity context corresponding to the graph and location. Movement between locations occurs frequently. With the exception of travelling partners (in this case Sean) the people met along the way rapidly disappear from the backpacker's immediate social network. Different kinds of communication (e.g. SMS, e-mail, phone calls, in-person discussion) are used for different purposes by the backpacker while at a given location.

The type of activity influences who is met and how much the social network grows and strengthens. For example, going out for breakfast resulted in meeting a group of new people, and a barbeque later the same day strengthened social ties to some of the same people (see Figure 98). In this case, travel locations were chosen based on where the backpacker or her travelling partner had friends, and these people in turn affected what activities they chose to do. Typical activities for this backpacker

included watching movies and television, visiting tourist sites such as the aquarium, sitting in cafes or talking with friends.

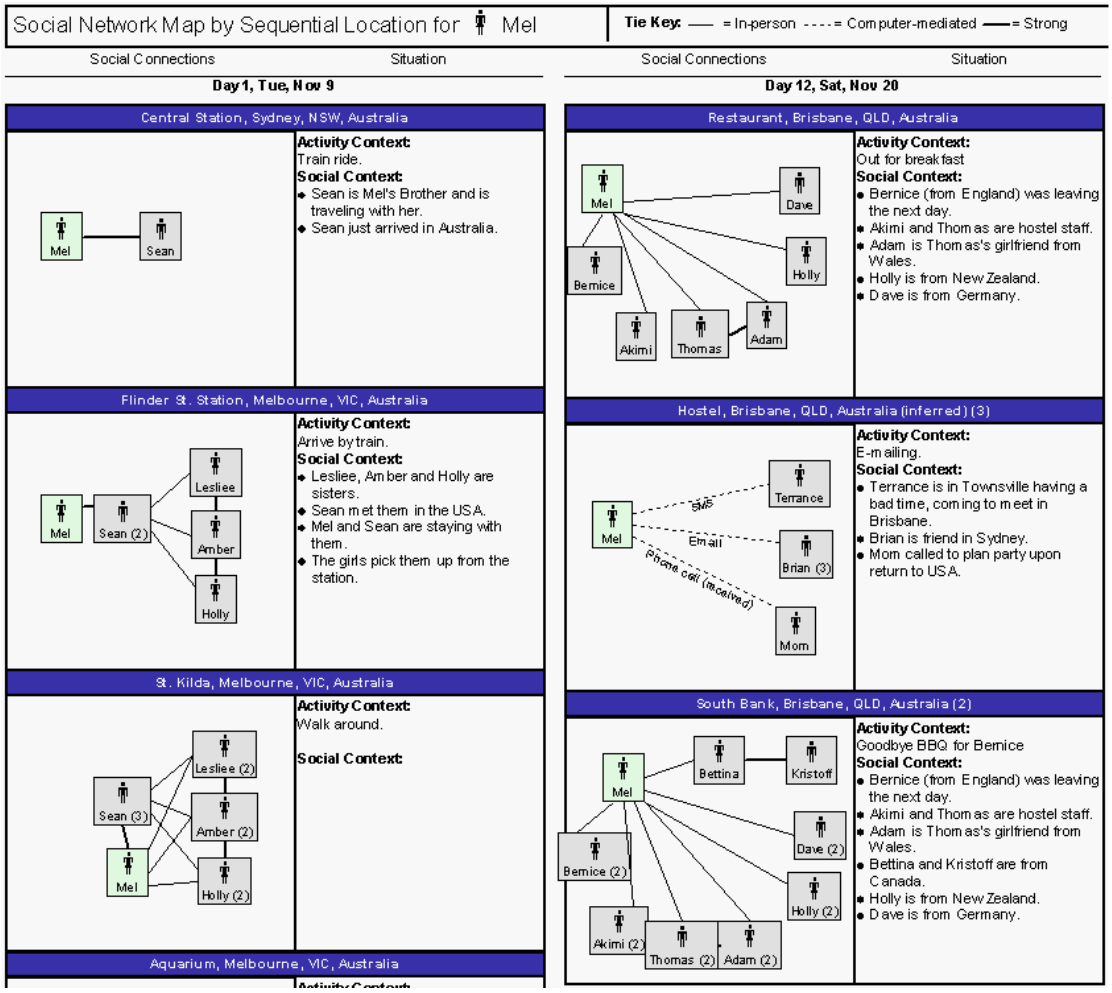


Figure 98: A section of a chart showing a backpacker's travel for several days. Location is indicated in the blue bars, social networks which formed at that location are shown on the left, and the activity and social context are listed on the right. Names have been changed. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-soc-net-by-loc.gif]

The complex relationship between people, activities and the developing social networks of backpackers is shown in Figure 99. This shows that some people are strongly linked to specific locations and activities (see the group of people met during the activities "Out For Breakfast" and "Watch Movie") while others have links to a wide variety of activities in different locations (see node 'Sean'). These charts can become unmanageable for longer time durations and this graph only shows three weeks of travel. Despite their complexity, the diagrams can allow visualisation of the types of activities that result in certain types of social network changes. For example,

determining activities which lead to meeting many new people, or those that lead to long-lasting friendships can be located and visualised.

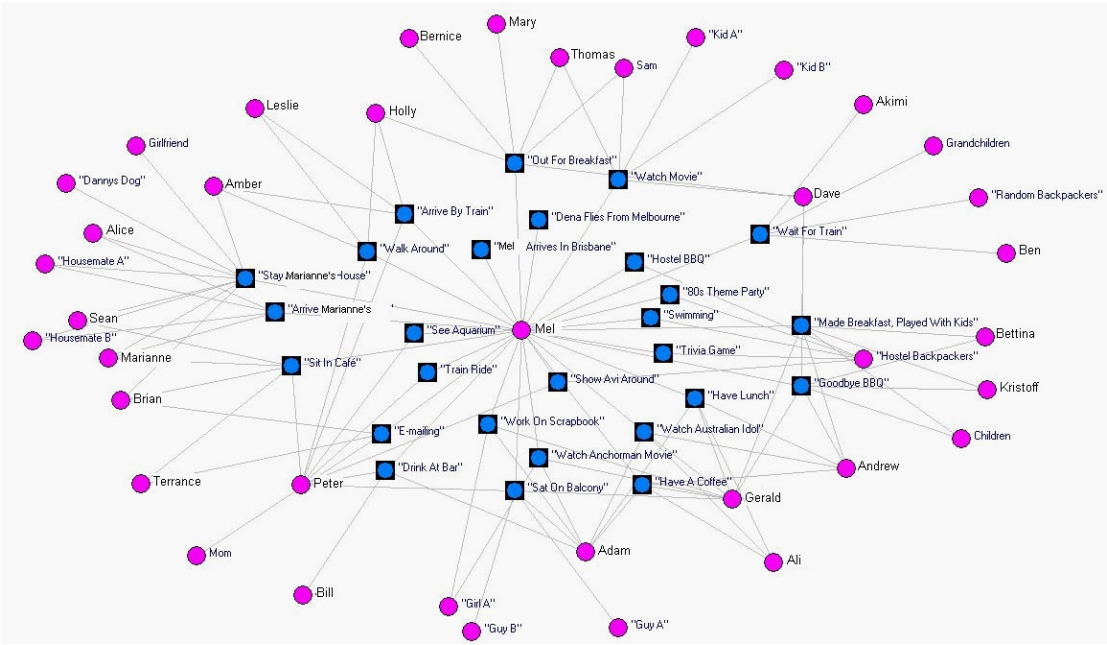


Figure 99: A social network graph showing the backpacker in the middle, surrounded by the activities she has done (blue squares) and the people she met through those activities (pink circles). Names have been changed. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-3.8-soc-net-activities.gif

3.8.2.2 Challenging Situations

Travelling through unfamiliar locations, cultures and people frequently produces challenging situations. These experiences range from simply being confusing to dangerous. Blogs regularly report these situations, probably because they are memorable, surprising and make exciting reading for an external audience. This section and the following one draw on excerpts from blogs to illustrate various points about travel. This is a useful design exercise because it identifies key situations where users have problems which could potentially be assisted by new technologies. Backpackers' stories about these situations explain the contextual details which were significant to them at the time and explain why problems occurred; however they do not often go to the level of suggesting solutions, which is the designer's role.

A situation which is sometimes difficult for backpackers is trying to find a room. Each new location is largely unknown and finding accommodation that is clean, affordable and easy to get to, is a frequent activity. During certain seasons, holidays, or events,

rooms can be hard to find (for corroborating evidence from MIS see Section 3.5.2.20). One traveller relates a story of trying to find accommodation in Argentina.

> *We arrived in Bariloche to chaos, apparently no beds free unless you went 12k out of town. Mistakenly though we had met a German guy on our bus who had done all the talking at the tourist centre in Spanish when we arrived, and he decided we would be better off getting an apartment with him and his four friends who had not arrived yet. It all got a bit confusing and we did not want to stay as long as him and his friends. So [we] decided we were better off on our own though it had got to 6 pm by now, back to the tourist office and remarkably there were heaps of beds now available!!! You just do not know who you can trust! - Anonymous*[29]

The above quote also mentions the difficulty in assessing local information sources. It is frequently the case that the only information available has a high probability of being biased. For example, this occurs at tourism offices or when approached by hostelling vendors at transit stations.

Backpackers frequently enter cities they have not been to before. They need to find hostels, restaurants, post offices and tourist sites (also see related requirements coming from MIS, Appendix B.2, item 1). Thus, it is not surprising that they frequently get lost.

> *I must say this is a beautiful city. Not to mention confusing, haha the amount of times I have gotten lost.. oy. - Anonymous*

Sometimes this can be amusing, but in certain circumstances it makes backpackers angry and sometimes places them in unsafe situations. A female backpacker discusses a visit to a village in Vietnam where it was not clear which areas were safe to travel in.

> *I arrived in Kontum and decided I did not like it here at all. I know that there are lots of different minority villages around but I did not like the feeling of the actual town itself and it seems really difficult to find out any information. I'm sure it would be fine if I was with friends but it is not very nice on your own. The worst thing about this place is the dogs. There are loads of them. Now, I'm not normally scared of dogs at all but I felt scared here. I was barked at*

[29] All quotes from blogs originate from www.travelpod.com.

> *and followed and found myself crossing the road back and forth to avoid dogs. I was so glad to leave the next day, even if the guy on the bus ripped me off. - Anonymous*

It is often the fear of the unknown which bothers backpackers. Most areas have some level of violence and it is difficult to ascertain just how dangerous it is without having lived there or talking with a trusted local. This is discussed at length by a backpacker travelling alone in South Africa.

> *I had to go into town to buy things for my safari but I was starting to feel as if I was too scared to leave the protective safety of the hostel to venture out to the shops. This is crazy. I know what can happen and all I can do is not be stupid. I know I look like I'm from out of town, that is cos I am, but you have to pull yourself out of this state when you're constantly checking your watch to see how many daylight hours you have left before thinking about scuttling back to the safety of your room. The hostels here do not help this either, urging you to take a cab to the nearest shops. I realise they are looking out for you as much as they can but its instilling a fear into one of everyone on the street that you really could do without carrying around. Anyway must go now as I only have half an hour of daylight left... - Anonymous*

These situations can arise due to a variety of factors in nearly any city that backpackers can travel to. Certain types of information and assistance can help reassure backpackers and enable them to make decisions which they are comfortable with. For example, the ability to join up with other single travellers to venture into town, or read the travel experiences of other single backpackers in that area recently, would have greatly assisted this backpacker in determining how to get into town to get her safari gear (also see related sections on online arrangement of travel partners 3.4.2.22; use of bulletin boards for ridesharing, Section 3.4.2.5; observations of sharing travel tips, Section 3.5.2.2).

3.8.2.3 Mundane and Boring Situations

Backpackers regularly find themselves in situations where there is little stimulation, and they often need to remain in these situations for a variety of reasons. Blogging about boredom may relieve some of the stress of the experience and is not an uncommon topic in blog entries (also see responses to boredom in the MIS study, Section 3.5.2.10). Travelling cheaply commonly means using mass-transit systems,

which tend to offer less room and more delays as the price goes down. The following backpacker talks about boredom during transit in Europe.

> *Half way through Harry Pothead, the flight as always was boring but it is getting me home so who am I to complain. Copenhagen Airport is also a boring place to spend 3 hours waiting for a plane. I think I see a pattern forming here. - Anonymous*

Similarly travellers often get stuck in locations because of issues such as not being able to arrange travel to locations they wish to go to. Different travellers have various reasons for disliking certain locations, and it is not uncommon to be forced to return to transit hubs or wait for transit to become available.

> *My mind is melting in the deadening haze of horrid Bangkok. I tried to go to Laos and I tried to go to Chiang Mai, but the flights are full and I do not have long enough to go overland and back, so I'm stuck amidst the apocalypse. Boring boring boring! - Anonymous*

Sometimes backpackers are bored because of lack of contact with other travellers. A quiet spot can be relaxing, but it is difficult to hear gossip about other locations and stay entertained in remote locations. This is illustrated by a backpacker's account of a situation in Fiji.

> *We were the only guests staying in the dorm. It was very boring. Decided to leave the next day, as it was MY BIRTHDAY!!! And I did not want to spend it in a boring little spot in the middle of nowhere. So back to Nadi for another few nights, many drinks, and the odd smooch with an 18 year old English lad... - Anonymous*

However, sometimes it is the other backpackers who are boring. Usually it is possible to avoid undesirable travellers simply by heading in a different direction or staying when they decide to leave. Nevertheless some group activities make it difficult to get away from others.

> *First night we spent on our pirate ship in Halong Bay with a crazy Brazilian divorce lawyer, a boring boring Czech and a poor timid petrified looking Japanese boy who we just got drunk to try and drown out the other two arguing. – Anonymous*

What is considered boring depends on the traveller; however distractions such as MP3 players, internet cafes, and books are commonly used by backpackers to help manage these situations.

3.8.2.4 How Travel Is Visually Recorded

Photographs largely represented short pauses in movement. This is also supported by observations of photo-taking and swapping behaviour in MIS (see Section 3.5.2.4). Examples include stopping on a trail to capture an impressive mountain or a group posing for a photo at a viewpoint before walking further. Transportation sometimes provided stable environments (e.g. the deck of a boat) to take photographs from, but this was not prevalent.

Over half of all photographs included people, and this reflects what travellers find interesting and memorable. The exact content and meaning of the photographs is often ambiguous, but the abstract purpose for taking the photo is often clear. Common reasons for taking pictures of people included:

- “Here we are at this location”, people standing in front of object or scenic view,
- “We are drinking and partying”, people posing with alcohol or celebrating,
- “Look at these people”, locals posing or doing interesting activities,
- “Look at us”, self documentation of the people a situation is shared with, and
- “This is what we did here”, recording activities done at a location

It is more difficult to determine the intent or purpose of taking non-human photographs as they do not show behaviour. However the following purposes are likely:

- “Look at this interesting animal”,
- “This is an important or interesting building or structure”,
- “Appreciate (or be jealous of) this amazing location”,
- “This is an object of interest or significance”, and
- “This is how we travelled”.

Figure 100: Objects of interest that were photographed.

Objects of interest were commonly photographed (see Figure 100). They usually represented things that were beautiful, rare, alarming, significant, different, or otherwise interesting. Examples include: a box of skulls, a dragon statue, a truck off the road, a zebra, a sign warning of dangerous jellyfish, a bull lying on a beach at sunset, a bottle of local beer and a strange style of rental jeep. Another habit worth noting is taking pictures of writing in the sand, which typically includes the names of the travellers and sometimes dates, locations or expressions of love. A list of a representative sample of 100 types of objects is included (see Appendix S).

Figure 101: Images conveying symbolic meaning.

Many of the objects photographed are iconic due to their heavy publicity (e.g. Sydney's Opera House) or symbols that lie within them (see Figure 101). Signposts or markers are very common objects to take photographs of. These objects communicate precise location as well as the corresponding culture, history and ambiance of a location that will be understood by an audience. For instance, seeing a picture of a rock wall, which is unmistakably the side of the Coliseum in Rome, may bring to mind Roman history, ice cream and warm weather based on a previous visit, or watching TV travel shows.

Designers need to understand the environments of backpackers, as well as the way they wish to record and explain them to external audiences. To assist with the first problem I have developed a chart which shows the physical context of a backpacker over time (see Figure 102). Each row depicts a new location and each column starts with a high-level view and moves into more detail further to the right. Scanning several pages of this chart rapidly conveys a rich understanding of the environment and movement of a backpacker, and it can be created from blog entries.

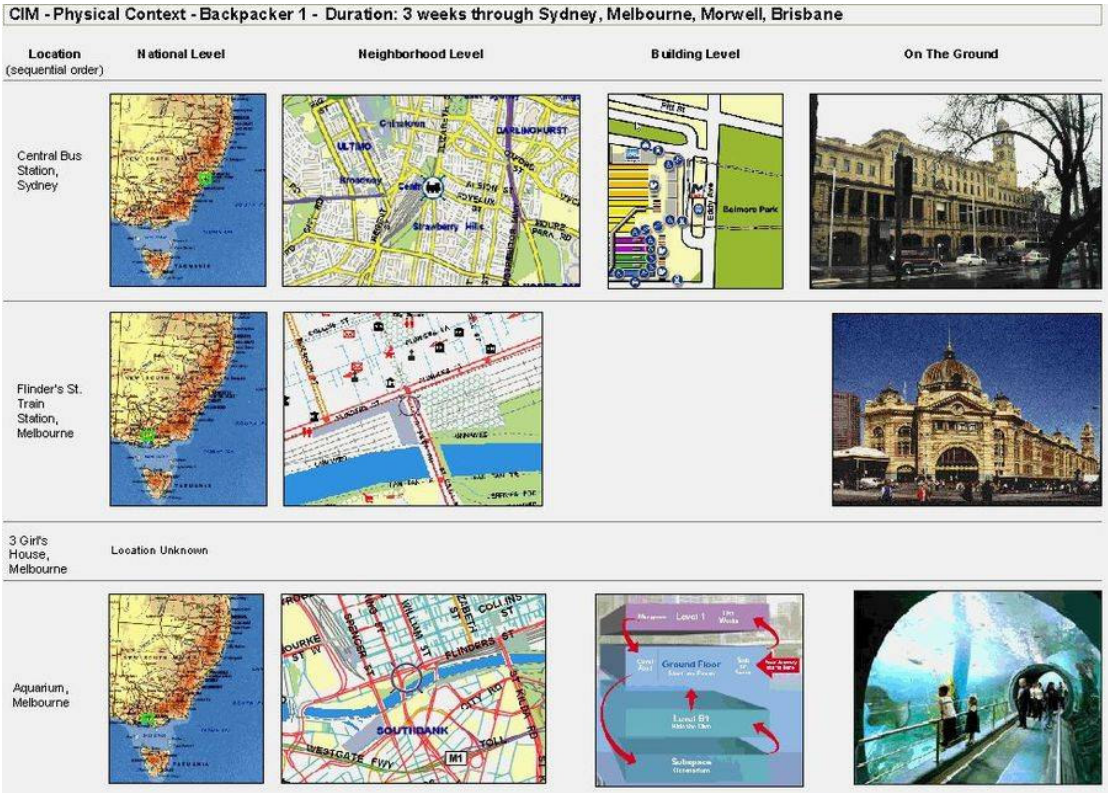


Figure 102: A graph of physical context shows varying levels of specificity of location as the backpacker moves. Each row is the next sequential location, and each column begins high-level and move progressively lower to the ground. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-3.8-physical-context.gif

3.8.2.5 How Communities Behave

All communities have patterns of behaviour that arise and norms which self-regulate behaviour (Baron & Kerr, 2003; Shaw, 1976). These patterns and rules are often noticed by individuals encountering these communities. An example is given by a traveller in Malawi.

> *It should not have come as a surprise after handing over my dirty laundry to see the owner of the Motel I was staying at, sitting in the sand hand washing my underwear. I was ashamed of my ignorance, assuming they'd have a washing machine. And when they were returned back to me, I had been charged double because apparently it was culturally taboo to hand wash someone else['s] underwear, and I could agree with that. I would have preferred washing them myself, and it would have saved me the*

> *embarrassment of having all the local boys stand near as he washed them giggling away at the funny white women's underwear. - Anonymous*

As illustrated above, a backpacker may need to mimic locals and watch the habits of other travellers when they first arrive in a foreign culture. Watching small samples of individuals can give a good impression of the actions of the larger community. However, there are aspects of communities which are hard to see from a bottom-up perspective such as this. Thus it may be useful, both for community members and outsiders to gain a top-down perspective on the collective actions of communities. To this aim a chart was developed showing collective movement of travel bloggers (who are also backpackers) in Australia (see Figure 103).

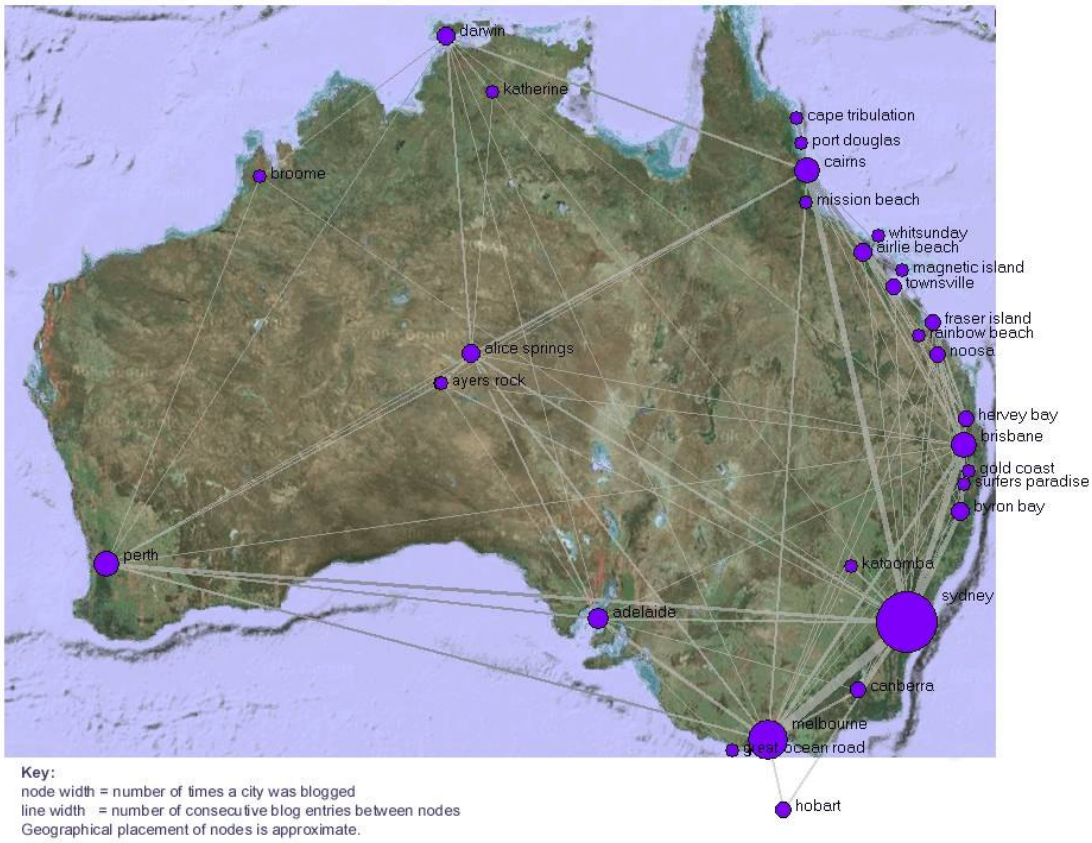


Figure 103: A graph showing the behaviour of bloggers in Australia. Circle size indicates the number of times a city was blogged about and line widths indicate the number of bloggers who talked about those cities in sequential order. City locations are approximate, node size and tie width are numerically accurate. Lines do not necessarily denote physical travel, but show implied ties between successive blog entries. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-australia-30-cities.gif]

The graph depicts how backpackers blogged about their travels. The size of the circle shaped nodes indicates how many blog entries were written about that location. Travel blog entries tend to be sequential and thus give a good estimate of the route the backpacker took (or is taking). While blogging behaviour can not be equated with movement, there is probably a close relationship between the two; bloggers are likely to record entries in the order they travelled and to back-date entries if needed. The graph shows the 30 Australian travel destinations that were mentioned most frequently and all connections between those locations if they existed. The width of the ties indicates the number of times bloggers wrote about its corresponding nodes sequentially. The graph is undirected (it does not show

direction of travel) so a blogger writing about Melbourne and then Sydney is graphed on the same line as a one writing about Sydney first and then Melbourne. It is feasible to make a directional graph showing two lines between each pair of nodes which would convey more detail. City location frequencies and dates are determined from individual location and time fields for each entry, not from the textual discussion in the entry. As this is intended as a proof of concept only, city nodes are placed approximately; exact map placement would not pose a serious challenge if map generation was automated.

The resulting map of Australian travel blogger behaviour reinforces some well-known facts in the travel industry, as well as holding a few surprises. The majority of the cities that were commonly blogged about were on the East coast. It is well known that many backpackers only travel up the coast, visiting the major cities and The Great Barrier Reef. However it was surprising to see the number of backpackers who seem to fly directly from Sydney to Cairns. It is typical to find backpacker travelling North or South on the coast, so it may be that many fly into Sydney and then direct to Cairns before backpacking South. Some smaller locations, such as Rainbow Beach, are not commonly considered to be popular locations; however they received a lot of attention from bloggers. There was also a great deal of travel to Perth from Melbourne and Sydney, but not Brisbane. The isolated Broome appears to be receiving about as much attention as most people in the travel industry would expect. Thus, it would make a good destination for backpackers wishing to get off the beaten track. Darwin receives a reasonably high amount of traffic given its size and position. Most people appear to arrive there from Cairns, although some go to Alice Springs and Uluru (Ayers Rock) first. The current scale of the map does not allow a more detailed analysis, but data is available to support more detailed visualisations.

A number of interesting statistics can be obtained from travel blog databases. This includes the most frequently blogged cities, the frequency of travel (as inferred by blogged cities), the size of a community and the pace at which it moves. The most frequent travel routes are shown in Table 4 and cities with the most blog entries about them are shown in Table 5.

Table 4: The most frequent travel ties between cities.

From	To	Number of Entries
Sydney	Melbourne	121
Melbourne	Sydney	111
Sydney	Cairns	60
Sydney	Brisbane	58
Brisbane	Sydney	58
Sydney	Byron Bay	43
Cairns	Sydney	39
Melbourne	Adelaide	34
Byron Bay	Brisbane	33
Sydney	Canberra	31

Table 5: The most blogged-about cities.

City	Number of Entries
Sydney	1536
Melbourne	841
Brisbane	427
Perth	401
Cairns	392
Adelaide	251
Alice Springs	190
Darwin	185
Byron Bay	175
Airlie Beach	163

Visualisations such as this can provide information to both community members and those outside the community to better inform their own actions. For example, members of the backpacker community might decide to go to less-travelled areas, or entrepreneurs might decide to build more hostels in smaller towns receiving high numbers of backpackers. Depending on the data shown, the backpacking community

could gain a better understanding of its own impact on foreign cultures. Accordingly, these technologies may be able to assist communities in self-reflection.

3.8.2.6 How Social Networks of Backpackers Form

Several diaries and blogs that were reviewed in detail showed a pattern of meeting a small group of new people at each major new location (e.g. a city). Sometimes these were acquaintances of the first person met, or people who were met accidentally while doing other activities. Since backpackers move often and do not frequently acquire travelling partners, most of the people they meet rapidly leave their social network. Exceptions to this occur when contact information is exchanged and varying degrees of continued contact occur. Occasionally backpackers arrange to meet up with other travellers they have met previously in new locations. It is also not uncommon to unexpectedly bump into travellers that had previously been met. This can strengthen social ties which had grown weak.

Over half of the blog photographs reviewed show people, and many of these appear to be people the photographer became acquainted with, but it is not clear in what fashion. There are also presumably a large number of people who are met, but not photographed. An advantage of the photographs is that they capture the environments in which group activities occur, which may be overlooked in textual accounts. These environments can encourage, stimulate or dissuade group activities. A list of 100 of these locations/environments is included in the group activities list (see Appendix Q). Examples of environments for group activities include: a dance club, trail viewpoint, bed of a truck, beach, bar, stadium bleachers, camp site, boat deck and kitchen. They also facilitate certain types of social interaction and influence both the social ties that develop within them and the type of information that is discussed (see Sections 2.1.2 and 3.5.2.2).

To further explore backpackers' social relations, I traced the growth of a backpacker's social network for three weeks using her diary (see Figure 104). The graph clearly shows groups of people Mel (a pseudonym) met, who also had relationships among each other. Line width shows the strength of the tie, which is weighted both by the number of activities they had shared and whether they had a familial or romantic relationship. For instance, Mel has a strong tie to Peter (her brother) and also weak ties to his friends, whom he had introduced to her. Many of the people a backpacker meets do not know each other (see the lack of bridging ties between different sub-groups in Figure 104). Thus, there is very little opportunity for

reputations to form (also see Figure 85 and Section 3.6.3.2). Backpackers meet people for short periods and new acquaintances are not typically able to contact people who have already formed opinions of them.

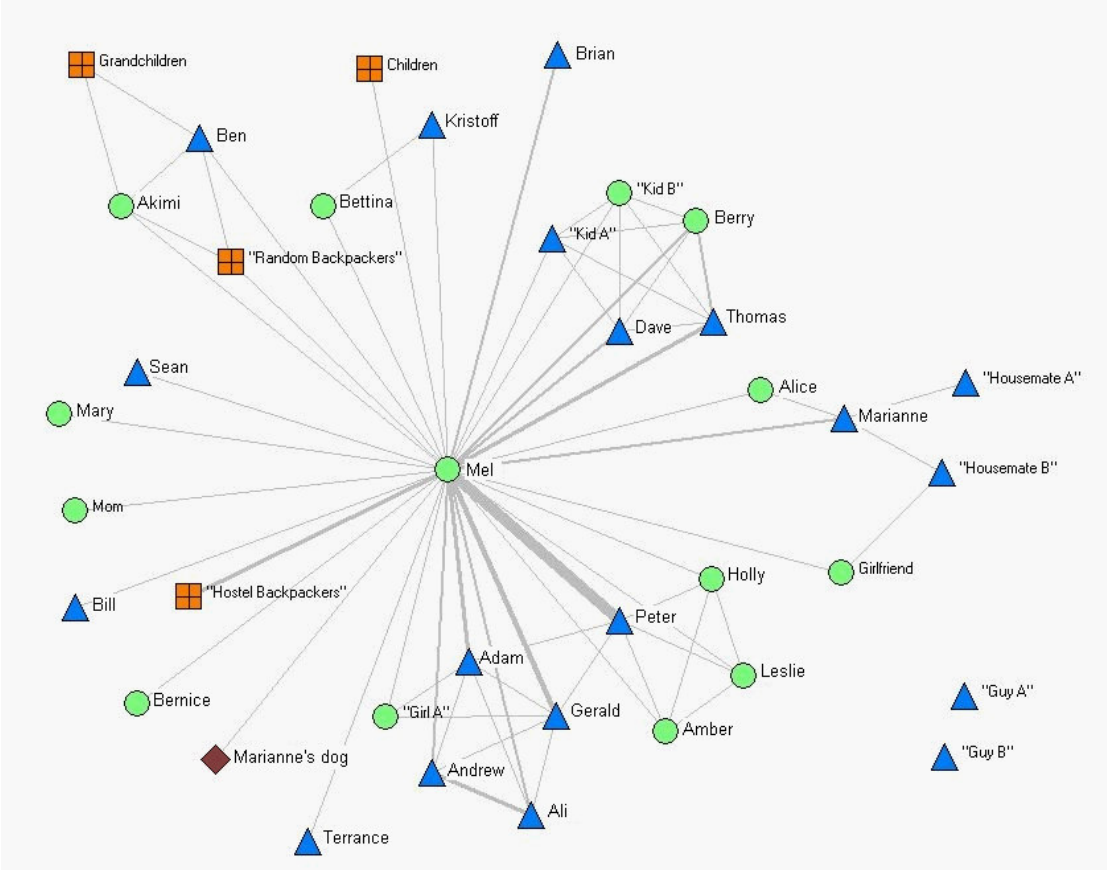


Figure 104: The graph shows the backpacker in the middle, surrounded by her social network developed during 3 weeks of travel. Female acquaintances are circles, males are triangles, groups are squares and animals are diamonds. Lines show the strength of social connections between these people. Names have been changed. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-social-net.gif]

3.8.2.7 How Information Flows Through Ad-hoc Traveller Networks

Backpackers use a variety of information sources including guidebooks, travel agents, tourist information booths, tourism magazines and gossip from other travellers to help decide where to go. Information obtained from other travellers is often trustworthy, current, cheap and fun to get.

> *I'd heard about the roads in Cambodia and how awful they are, but I'd also heard that the road to Siem Reap was one of the better ones. I cannot fathom how a bad one looks, since we drove around 3 foot deep potholes, and virtually the entire road was one big red dustball. - Anonymous*

In the above case, they not only heard about the condition of the roads in a location before they arrived there, but also advice on which route to take. In a country where bridges wash out and areas become politically unstable, gossip may be the most useful source of information to assist in getting to a destination. Similarly, another traveller used gossip to strategically request safe delivery to a local hostel.

> *During our stay in Brazil we heard "Rio is very dangerous!", "Salvador is very dangerous!", "Belo Horizonte is very dangerous!" .... but, according to several travel guides, Lima was very dangerous city! Very reassuring when your plane lands in the middle of the night. We therefore asked the youth hostel to pick us up, which they did [for] a mere $10 bank note. Anything is possible in Peru if you pay in dollars.- Anonymous*

It is also common for backpackers to find out about places that they would enjoy (also see observations of these conversations in MIS, Section 3.5.2.2). Backpackers who get a chance to know each other customise their recommendations based on what they know of the other person. The following backpacker comments on blending personal tastes and travel recommendations to find a location he liked.

> *Arriving in the Chilean capital, I expected to find a nice, pleasant city - both from what I had heard about it from other travellers, and the fact that I had liked the modern yet historical vibe of the other capitals I had visited so far (except for Brasilía, of course, which has no history!). I was not disappointed, and immediately thought of the leafy streets, parks and mixture of modern and republican (as in post-independence) architectural mix as like a mini Buenos Aires. - Anonymous*

Photographs and digital cameras present an additional way of explaining recommendations to other travellers. Previous ethnographic work determined that this occurs in-person, using LCD screens on digital cameras, and to a lesser degree on TVs in hostels via digital camera connections (see Section 3.4.2). In this manner, imagery of places people intend to go can be shown to them before they go, possibly changing behaviour. Backpackers have also been observed taking photographs of each other and then arranging to send them via e-mail (see Section 3.5.2.9). This is an example of gift-giving (Taylor & Harper, 2002) and formation of social ties. Backpackers have also told us of including a few photographs in group e-mails they periodically send out while travelling. This is similar to travel blogging and will probably be replaced by the more efficient blogs as they become more popular.

The pictures represent information about travel in a visual format, which spreads along the lines of social networks. These networks are ad-hoc in that portions of them unexpectedly form, and dissipate as need and relevance wane. They often start out collocated (e.g. in a hostel or bar) and become widely distributed, often spanning the world as people move. Portions of these networks are more stable and form lasting relationships. Photographs represent a portion of the information exchanged which helps to communicate meaning, emotion and perceived experience of travel to an external audience.

3.8.2.8 User Feedback on Social Network Visualisations

Many of the visualisations previously presented (Figure 98, Figure 99, Figure 102, Figure 103, Figure 104) were generated because the data was available, a demonstration of possible visualisations was needed, and tools were needed to assist data analysis. This was a data-centric development model which was not particularly user centred. Previous projects presented here (see Sections 3.4.2.23, 4.3.2) investigated backpackers' perceptions of social networks and practical outcomes of being part of social networks. However, it was necessary to introduce users into the process of designing the graphs generated from the diaries.

This was completed via an online forum hosted on a private server. A project partner and blogging service, TravelPod announced the forum in a newsletter to travel bloggers. 13 travel bloggers who volunteered reviewed the charts (with anonymous data) and corresponding scenarios which described how they might be used in blogging products. Some of the diagrams were popular and others were not.

Respondents said the following about the graph showing blogging patterns, (see Figure 103)

"I think it would be interesting to see where other bloggers are going. It could be useful for large countries (e.g. China, Brazil) that you want to see as much of as possible, without backtracking, and taking in all the major sites. I think a five-year time frame would be too long - may be one to two years."

"I think that map where you can see the A to Z trip of everyone is awesome. It can give traveller ideas of where to go. If I would have had that kind of help while I was travelling by myself, it would have been easier to decide were to go, and judging by the size of the circles, you can see if it is a touristy place or not! I would like if it would show the past 5 yrs! If the circles could be zoomed, that would be perfect, a

bit like on Google Earth, so you can see smaller towns, and less touristy areas! It is always nice to get away from the crowded path!"

Another popular graph was the basic social network visualisation showing a summary view of who had been met over a period of time (see Figure 104). Bloggers expressed an interest in seeing how those they met were connected and remembering people. Unpopular graphs included the chart of sequential locations (see Figure 98) which was thought to be too detailed and was primarily designed for use by designers. The physical context chart received mixed reviews. Some respondents liked the visual review of their (or others) trips, and some did not see a use for it.

This feedback showed an interest in the travel blogging community for social network-based visualisations. More studies are needed to explore showing bloggers their own data and experiment with using the visualisations while travelling to understand present community behaviour.

3.8.3 Discussion

While the data obtained from diaries is by no means comprehensive and does not provide definitive accounts of behaviour, it does provide a great deal of informal insight into the behaviour and environment of backpackers. Without straying too far from documented behaviour it is possible to speculate about intent, goals, needs, problems and device usage in order to inform design decisions. In the following sections these issues and the utility of diary methods for understanding user requirements are discussed. We also think that is likely that the descriptions and images of travel that blogs provided offer inspiration for new design ideas that extend existing behaviour in novel ways.

3.8.3.1 What Backpackers Want To Do

Backpackers engage in a wide variety of activities, including both the typical tourist activities as well as more unique kinds of travel that are off the beaten track. Many of the photographs show activities that typical tourists would not take part in. Examples include skydiving, remote trekking, Thai boxing and living out of a mini-van (this is supported by interview discussions of backpacker identity in Section 3.4.2.1). Photographs of objects reveal what the photographers found interesting. They liked seeing new kinds of animals; they enjoyed looking at local artwork; and they took pictures of other people’s road signs and historical monuments. A large percentage

of the photographs included people, and many of these included groups, and presumably strangers who had been met by those travelling. The desire to meet people, have fun and experience how other people live is apparent in the photographs. It is common for local people to be pictured, showing how they act, look and live. Many of these goals and desires of backpackers which are indirectly communicated through their blogs and photographs corroborate and clarify previous findings from my previous interviews with backpackers (see Section 3.4.2).

I would be amiss not to mention that many backpackers are interested in sex while travelling. Many backpackers are 18-25 years old, single, on vacation, experiencing daily excitement, and meeting large numbers of new people daily. They usually travel for six months or more, and many do not travel with a sexual partner. Often, they are going through an exploratory phase in life where they experiment and determine how they want to be in the future. One hostel manager we talked with said “Anything that *can* happen here, *does* happen here.” There is also a low perceived risk factor as it is easy to leave a situation where a mistake has been made and commitment is low. Backpackers have sex with both other backpackers and locals. There is a distinct type of travel called ‘sex tourism’ which involves people travelling for the purpose of having sex with prostitutes (*Sex tourism and prostitution : aspects of leisure, recreation and work*, 1998). While some backpackers do have sex with prostitutes, there is usually an awareness of the larger cultural impact of this behaviour and interest in a variety of other subjects while travelling. However, their photographs reflect sexual topics, showing drunken play, and kissing locals and other backpackers, in addition to more intellectual pursuits. Hostels often have advertisements for work doing nude photography and other pornography as backpackers often look for short term work.

Backpackers greatly enjoy recording their travel experiences. The increasing use of travel blogs, the extensive photo collections, the predominance of cameras, and the continued use of paper journals all attest to this. A large percentage (75%) of the non-people photographs pictured very large outside environments. This leads us to believe that backpackers are trying to communicate a higher-level understanding of the terrain as well as more of the context about the situations they are experiencing. However, there are many aspects of these rich travel experiences which are necessarily not captured in photographs and consequently less likely to be understood by those at home.

3.8.3.2 What Backpackers Want To Record

Photographs are primarily taken to 1) record experience for later personal use and 2) to communicate travel experiences, often while they are taking place. In the case of recording experience, backpackers want to be able to re-live portions of their travel experience (post-visiting) in a great deal of detail as possible at a later date (Brown & Chalmers, 2003; Frohlich, Kuchinsky, Pering, Don, & Ariss, 2002). Current recording technologies only offer a patchwork of different perceptual modes and occasional recorded sections of an ongoing stream of experience. In the case of communicating experiences (e.g. via blogs or e-mailed journals) the recordings are often partially censored and writers can be selective about what they choose to report to family and friends. Recordings also enable a variety of other activities such as gift-giving, group-awareness and safety measures (Chalfen, 1987).

What backpackers have *not* photographed is as informative as what they have. A variety of activities which are known to occur regularly from ethnographic observations and interviews (see Sections 3.4.2.2, 3.4.2.21, 3.5.2.11) are not widely reported in photographs. Some of these include: hostel environments, sleeping, food, intimate moments with significant others, and normal or uninteresting situations. This is similar to the findings of domestic photo sharing research which demonstrates a lack of documentation of unpleasant events such as sickness or death (Spence & Holland, 1991). Like any good story, accounts of travel experiences tend to focus on the exciting, scary and surprising aspects of the travel experience. This necessarily biases both the backpacker's memory and communication of the experience to others. This is not necessarily a bad thing, but it is worth noting that it is currently too tedious to record *everything* and that only special moments are likely to be captured. This also has implications for the accuracy of requirements analysis using this data and the need for other methods to capture the mundane aspects of travel.

3.8.3.3 How Cameras and Blogs Influence Depictions of Travel

Cameras enable and encourage the capture of certain types of experience. For instance, capturing panoramas, outside environments at night, or images while in unstable situations is difficult. A large number of photographs of people showed them standing or sitting, but very few walking, running or climbing. This is despite the fact that due to the context of the situations, the people were almost certainly walking or running immediately prior to taking the photograph. Cameras appear to be used in short pauses in movement and it is probably part of the culture to know how to pose

for a photo properly. Hence the camera changes how we move (often encouraging us to stop moving) in order to record our experiences. Video on cameras may change this, but storage, uploading data, quality and usability remain issues.

The photographic medium (and to a lesser extent text) tend to focus on the details of travel at the expense of the larger picture of what is occurring. For example, a travel blog entry has a date and location stamp and commonly contains an entry about that short time-period, as opposed to broader summaries of travel or meta issues. Photographs in particular tend to depict a split-second of time instead of longer-term interactions. Some travel sites[30] offer indexes of blog entries and maps of movement around the world, but this only scratches the surface of the possibilities for summarisation of travel. Blogs are created and knowingly used to allow public advertisement of travel experiences (although some blogs do support restricted access.) The information which backpackers choose to write about or share via photographs is therefore in part coloured by their intended audience. Backpackers we have interviewed did not censor a great deal, but e-mail journals to parents were often different than those to friends. In some cases for bloggers, or those e-mailing travel accounts, self-censorship may simply be too difficult, possibly leading to more honest accounts of travel or restricting access to specific readers.

3.8.3.4 Design Implications

Please see Appendix A.4 for a list of design implications.

3.8.4 Summary

The results of a diary study and a travel blog analysis have been presented which aim to better understand backpackers' requirements for travel technologies and the situations in which they might be used. Both forms of diary (paper and electronic) were used to formulate graphs and visualisations depicting individual and community behaviour of backpackers. Blog entries were also used to provide excerpts of rich travel experiences pertaining to specific situations relevant to design. These experiences can easily be used to form vignettes or scenarios.

Blogs have a number of advantages over traditional diary methods for capturing travel data. These include increased accuracy, the inclusion of pictures, logical

[30] www.travelpod.com

structure, digital formatting and immediate availability. Blogs are an excellent resource for requirements analysis or explorative research if they are available on topics pertaining to the product being designed. Databases of numerous travel blogs present the possibility of producing visualisations which depict the behaviour of large communities of mobile users. This type of information may be useful both for community members and external parties who wish to better understand and respond to community behaviour. Larger and more diverse travel communities could form if 'walled garden' blogging sites connected to external blogs on similar topics, such as is already done amongst open-source blogging tools. The potential of detailed blog databases, automatic tagging and moblogging hold a great deal of promise for future blogging activities. Collaborative community visualisation between walled gardens or individual blogs would require an open protocol for querying blog data such as date, location and people. It may also make sense for standard blogging tools to adopt features depicting movement, thus representing a blend of traditional and travel blogs. This would support our increasingly mobile culture and lifestyles.

3.9 Summary of the Research Studies Chapter

This chapter has covered a range of studies from contextual interviews to remote feedback from travelling backpackers. The methods were intended to be in-situ, and to investigate opportunities for mobile group communication devices. They also are ethnographic in that they observe natural behaviour, and user-centred in that they focus and include backpackers in the design process. A variety of methods were used to triangulate on design issues and this allowed comparison and corroboration between studies (in particular see Sections 3.5, 3.8). The methods were structured to explore different aspects of time (short or long duration of interaction) and participant distribution (distributed or collocated) (see Section 3.2).

The research began with a site survey and contextual interviews held at a series of hostels. This was designed to explore high-level topics and determine broad behaviour and environmental issues, primarily from self-reported data. This was followed by the MIS study which used a great deal of observational data and investigated in-situ mobile group tourist behaviour. The study after this was a detailed exploration of a known primary activity: pairings between backpackers for the purpose of exchange of travel tips. This was followed by a study which used

postcards to query distributed backpackers about how their environments affected their needs. The chapter concluded with a study looking at both high-level community behaviour and detailed daily activities of backpackers via online and offline diaries. Collectively these methods have demonstrated the gradual stitching together of a patchwork of design information, with some issues proving to be more or less important as more information becomes available. These studies have resulted in numerous design ideas (see Chapter 5 and Appendix A) and requirements (see Appendix B), in addition to the methods themselves. Practical usage of these methods is described in the following chapter.

4 Practical Use of Methods

This chapter is dedicated to reflection on the details of realistic usage of the methods promoted in this thesis. Research papers commonly gloss over the difficulties of planning and running studies, social problems with the use of prototypes, data analysis challenges and other practical issues. Since this thesis is primarily about methods, it is important to review method structure at a detailed level and provide recommendations for future users of these methods. All five studies covered in the research studies chapter (see Chapter 3) are reviewed again here, with sections reviewing the method, reflecting on its use and providing recommendations for effective usage. An additional outcome of this research is *method templates* which facilitate rapid use and evaluation of the methods presented here. The latter four methods provide a template at the end of each section. This chapter begins by presenting a taxonomy for the methods which shows what activities they relate to.

4.1 Introduction to the Methods Used

The methods presented in this thesis have a range of different goals. At a high level, some of them aim to observe natural behaviour and interact with people in the design environment to understand it better. Evaluation of specific design ideas can occur in mobile settings or more stable settings. For a broader perspective, samples of larger numbers of people with less detail can be performed. All of these strategies have been used in this doctoral work, and some methods cover more than one area (see Table 6). The five methods used are shown down the left column. The strengths of each method are shown to the right.

Table 6: A taxonomy showing different purposes for methods used. Solid cells indicate full coverage, chequered cells indicate partial coverage.

Method	Naturalistic Observation		Prototype Exploration		Community Sampling
	Reported	Observed	Mobile	Stable	
Site Survey + Contextual Interviews (see Section 4.3)					
Field Trips (see Section 4.4)					
Social Pairing Exercise (see Section 4.5)					
Contextual Postcards (see Section 4.6)					
Diaries (see Section 4.7)					

The site survey and contextual interviews with backpackers was primarily concerned with observing the hostel environment and learning about the lives of backpackers as they reported them to me. The field trips (MIS studies) shifted the focus to observed (as opposed to reported) behaviour, moved observation to a mobile setting, and introduced prototypes. The social pairing exercise explored the use of a prototype in a stable environment of a hostel. The contextual postcards sampled a larger number of people distributed across a broad geographical area, but targeted certain questions. Similarly the paper and electronic diaries sampled larger numbers of backpackers at a high level, and a few blogs were used for detailed post-hoc observation of behaviour. The following section explains the ‘out of document experience’ sections and is followed by an analysis of all of the methods used.

4.2 Embodied Demonstration of Methods

User centred design (UCD) processes have a recursive component: theory that can be applied to *guide usage* of design methods can also be applied to the *teaching or demonstration* of design methods. From this perspective, instructors use a process and methods to teach students how to use UCD processes and methods. Thus it would be hypocritical to use a non-UCD approach for teaching use of user centred methods. This thesis advocates both UCD and in-situ, participatory development activities with groups of potential users in their natural environment. While these methods have been evaluated, it would be hypocritical to not use group activities, set in the real world, as a way of demonstrating use of the research methods. Consequently there is a portion of most of the following method sections called *Method Templates*. A method template is similar to a pattern in that it shows typical aspects of conducting a study and common issues to watch for. The methods described in the templates can be used rapidly and inexpensively, and they can be fun. The templates are intended to facilitate easier dissemination of the methods, and to provide readers with an opportunity to try using the methods themselves. The four Method Templates are also available as separate PDF files here: http://share.userdesign.com/thesis.

4.3 Method: Site Survey and Contextual Interviews

The following sections briefly revisit the study method: contextual interviews and site surveys, and discuss practical issues and recommendations for using it. This method primarily addressed naturalistic observation of backpackers and their environment. For a more detailed description of the method or results of the study please see Section 3.4.

4.3.1 Brief summary of method

Contextual interviews with 24 backpackers (some of whom travelled in pairs) were held at two hostels in Brisbane, Australia. Interviews were semi-structured and held in public areas such as kitchens, lounges or porches. Backpackers were invited to discuss the backpacker community, communication patterns, travelling habits, travel gear, and recording and sharing of travel experiences. A short participatory activity was also conducted with three participants, which used a board with a social network graph to elicit social tie information. Tours of five hostels were conducted and

recorded with photographs. Message board postings in the hostels were reviewed for content themes and purposes.

4.3.2 Reflection on method

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

Figure 105: Describing social ties to friends and family members while travelling.

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

However, the social network board worked well. It was intuitively understood by participants and offered a tangible way to show social ties. It also worked well on hostel tables or floors (see Figure 105). However, it rapidly showed us how much social ties depended on location and circumstances, and were fundamentally

dynamic. This indicated we should not be evaluating them at only one place and time (as we were doing), so we stopped using it. Hostels are not always comfortable with photographs being taken. Sometimes we had to find staff to show us around and selectively ask to take pictures. Finding notice boards was sometimes difficult due to the maze-like structures of some hostels; however, the resulting photographs were very useful.

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

4.3.3 Recommendations

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

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

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

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

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

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

4.4 Method: Field Trips

'Field trips' are defined in this thesis as mobile group activities which occur outside, and which are preferably as natural as possible (see Section 3.5). Field trips can be used for a variety of purposes, but they add an element of physical and social validity for mobile design work. The MIS studies (see Section 3.5) used field trips, but I also conducted an exploratory study called Territory is the Map (TIM) prior to this. While this was not understood as a field trip at the time, it can now be understood as such. The following section discusses methodological issues concerning field trips in the TIM study, and the subsequent section discusses them in the MIS studies.

4.4.1 The Territory Is The Map (TIM) Study

The following sections briefly revisit the study method: field trips, and discuss practical issues and recommendations for its use based on experiences in the TIM study. This method was primarily structured to investigate mobile prototype usage, but there was an element of watching emergent rendezvousing behaviour. For a more detailed description of the method or results please see a separate paper on the topic (Axup et al., 2005). As this study did not directly pertain to backpackers, it is not covered in detail in this thesis; only the methodological considerations are addressed below.

4.4.1.1 Brief summary of method

The TIM study was conducted in the Palmerston, Northern Territory Australia to investigate mobile group collaborative behaviour and use of contextual information during navigation. Three participants were placed in separate, unfamiliar locations (a central bus-station; a suburban park; a university bus-stop) approximately 1.5 km from a central meeting point. They were given a specific description of a playground in a small park, of an unknown location and were requested to find it and gather all of their group members there. It was requested that they use only a prototype SMS-based mobile discussion list to communicate with their team members, and that they

not ask directions from people in the environment. Each participant was followed by an observer who recorded behaviour on a clipboard, as well as taking photographs when SMSs were received, sent, or other interesting events happened. An SMS server logged all communications received, sender identity and time stamps.

Following the rendezvousing activity, a post-questionnaire and post-activity workshop were conducted with the aid of photographs from the study. The photographs were also used to re-walk the paths of all participants after the study, marking location and orientation on a map. Custom web pages were used to combine SMS log data, pictures and picture time-stamps, which permitted custom sorting and filtering. Spreadsheets were used to analyse and annotate observer logs. An aerial photo of the precise area taken from 2000M was used for further analysis.

4.4.1.2 Reflection on Method

Since the study was intended to be exploratory in nature, multiple methods were used to gather as much information as possible. The study used three observers shadowing, mobile note taking, photographs, a SMS server log, location tracking, surveys, interviews and a post-hoc workshop. Each technique is reviewed based on how it was used, why it was chosen, advantages and disadvantages, and possible improvements.

Shadowing

Determining the causes of observed behaviour or problems experienced by users can be very difficult. Shadowing provides situated observations of many factors in the mobile environment and a rich memory of the activity for observers. This method worked well for the research team with the exception of note-taking problems detailed below. The researchers did attract attention from passers-by as we acted strangely and carried clipboards and cameras. A side effect of SMS communications we had not anticipated was the level of privacy of the group's communication. It is hard to look over a user's shoulder to see what they are typing, and incoming SMSs did not beep if the user was currently composing a message. Consequently, despite the fact that we were literally following the users around observing them, we had no idea what the group as a whole was doing. In contrast, other communication mediums (such as voice calls) broadcast private information to anyone nearby. For the purposes of the study this made understanding what was going on very difficult. The observers did not gain a reasonable understanding of what had occurred until the participants met at the end and in the post-study discussions.

Note Taking

It took a long time to write comments by hand and it was difficult to do while walking. Additionally we time-stamped entries noting SMS in or out, to the minute. Observers sometimes held the camera in one hand, under the clipboard holding the notepad, or in the other hand holding the pen. Timestamps were made from wristwatches. Juggling clipboard, pen, camera and watch while walking and observing was challenging. Written notes often had to be postponed because they took too much time to write and meanwhile interesting events happened or pictures needed to be taken. Observers tried to pause to write notes, but this was not always possible as the participants frequently moved. Detailed observation of message composition or reading behaviour was too hard to do while moving and would probably require a micro-camera mounted above the phone on the user's head. Later review would have been improved if all notes had been time-stamped to the second, and if a faster, mobile and easily digitised input method could be found (see Section 4.4.2.2).

Photographs

The digital photographs worked well for our purposes; they automatically recorded timestamps and the 183 resulting images show situational variables, posture and location. As noted above, SMS alert tones were not always audible and we quickly resorted to taking pictures every few minutes or when interesting events occurred. Taking photographs while writing was difficult. The cameras were often held one-handed and photographs had to be taken rapidly. Photographs which were most useful were taken 15-20 feet behind the participant, which enabled seeing the posture and environment of the users. Some detailed photographs of handheld usage or facial expressions were also useful.

Photographs had advantages and disadvantages over video. Reviewing picture data in sequential order was a simple process, and pictures already focus primarily on the most interesting parts of the activity. However, this proved to be a problem as well, because it was not always possible to determine what was important and at times during analysis we wished we had pictures that were not available. 360 degree head-mount video-cameras are now available, but this would significantly increase cost and data-analysis problems and perhaps still not focus sufficiently on the group member.

SMS Server Log

SMS messages travelled from the sender's phone (Nokia 3650), through the cell network, to a server phone (SE T68i), connected by Bluetooth to a laptop running the server. The laptop was in the back seat of a car in a shopping centre parking lot. Incoming SMSs were appended to a text file and recorded: year, month, day, hour, minute, second of receipt of the SMS, sender's name (determined from the sender's number), the sender's phone number, message body before being changed, message body after being changed and an indication if the message had to be truncated. After processing by the server, a new message was sent via the server phone, through the cell-network and to the recipients' phones (Nokia 3650).

The server log provided an exact account of all communication that occurred during the group activity (verbal discussion in person or over a voice connection was disallowed.) Having a database of timing and content of communication has provided an invaluable resource for integration with other data sources and for analysing specific interactions. This was much more effective than trying to read messages while participants wrote them. With our sample size it is not appropriate to calculate statistics, but databases simplify the process of determining conversation rates, group member participation levels, message length and other metrics which may be informative for guiding interface design.

Location Tracking

GPS units were not available, but we wanted to understand movement of the group during the activity. Consequently we used the 'low-tech' method of retracing the paths of all three participants using the photographs taken during the activity. The best map of the city, commonly sold in gas stations, was spatially inaccurate. The roads are too wide and details were missing from the parking lot surrounding the shopping centre. We sketched-in parking lots and driveways where they actually existed. Applying GPS coordinates to this map would have resulted in errors which did not occur using our manual method.

Figure 106: Experimenter logging a location identified by a picture on a tablet computer held by another experimenter.

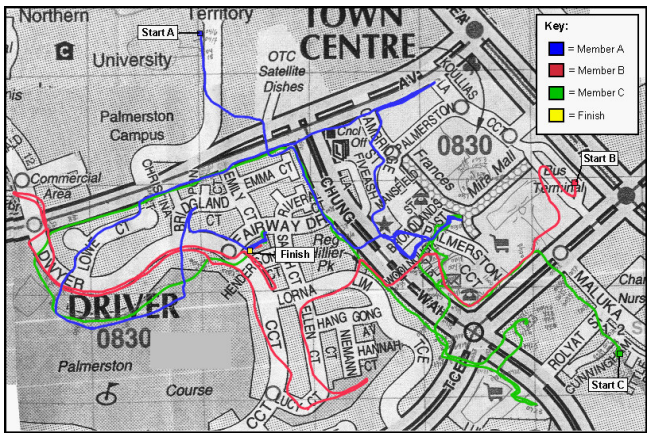


Figure 107: Map showing the routes followed by all members during the rendezvous and the start and end points.

With between 42 to 71 images taken for each group member, printing out large versions of the images would have been laborious and expensive. Instead we used a tablet computer to sequentially walk through the images for each member. Glare on the tablet computer's screen was a problem, particularly when the observer was wearing sunglasses. Finding locations and orientations from photographs which the experimenter had themselves traversed was fairly easy, because they could remember what route was followed (See Figure 106, Figure 107). However, one observer was not available to re-walk the routes taken and the 'trail was lost' several times by the other observers. While it was possible to determine approximate paths followed in this manner, GPS tagging might be a less laborious solution. If GPS were used a spatially accurate map would be needed (possibly Google Maps); however this might exclude socio-cultural information encoded on typical maps and used by participants.

Interviews

Participants were interviewed before the activity, to some extent during the workshop, and in a contextual interview in the shopping centre with one participant who left early. The initial interviews discussed participants' background experience and trained them in use of the phones and the discussion list. The context interview in the field produced useful comments in part because it was immediately after the activity, emotions were still high and the participant was able to make use of the phone and environment to explain topics.

Interviews during the workshop utilised the mobile phone's record of messages as a memory aid and prompt for participants. Using SMS logs on the phones as prompts did not work as well as expected due to lost messages and phone problems. While each person was interviewed individually, in practice the others were listening and joined in with comments. There is a tension in studying group behaviour between the importance of seeing individuals' opinions and allowing recall of a collaborative activity to be collaborative in nature. We compromised by starting with individual accounts and moving towards a focus group style interaction.

Analysis Methods

All of the data was converted to spreadsheets, and from there portions were imported into SQL databases. Custom PHP scripts were used to create tabular interfaces for reviewing the data. Two layouts were created:

1) Sequential Data View
This contains a table with columns for Time, Participant, Picture, Filename. It is sortable by time or participant. An additional function allows interspersing SMSs with pictures, sorted by time or participant.

2) Group Communication View
This contains a table with columns for Time, Member A, Member B, Member C, sorted by time, showing pictures and SMSs (see Figure 108).

Layout 1 was created first and allows rapidly locating images for a given person part way through the activity, or a complete sequential narrative of where people were and how communication corresponded with physical context. We found it hard to visualise how different members were interacting, and created Layout 2, which simplifies seeing interactions and how information flows between participants. Understanding what an entire group is doing at a particular time is very challenging (even for group members) and these data views greatly assist understanding collective states. It took us several weeks to develop this interface, but if automated, it may be useful during the interview process with participants. Assisting recall with pictures has been found useful in other studies (Axup, Bidwell, & Viller, 2004; Buur & Soendergaard, 2000).

It is worth noting that conceptualizing collective group behaviour is inherently difficult. For example, I was an observer and found my analysis and understanding of the activity biased by my own memories of the event (from the perspective of Member

C). While these methods helped to provide the 'bigger picture' of what happened, additional methods are needed to improve collective understanding both by researchers and group members.

Time	Member A	Member B	Member C
13:19:28	Member A says: Wru c?		
13:19:30			
13:19:41			Member C says: Heading 2 main roundabout
13:19:50			
13:20:04			
13:20:20			
13:20:22		Member B says: Terminal.Moving 2 ampol	
13:20:48			
13:20:54			

Figure 108: In the Group Communication View SMS messages and pictures are combined and time-stamped to show the collective narrative of the activity.

General Issues

Tracking mobile, physical and communicative behaviour is very challenging. Major difficulties experienced while running the study included:

- recording observations in a digital format to improve analysis efficiency,
- selecting which aspects of context to focus on with limited attention available,
- coping with large data sets of movement and communication logs,

- getting a rich set of data without altering the users' environment too much,
- consistently recording timestamps to be able to triangulate between data sets, and
- recreating a particular problem for group members may involve determining physical, social, temporal (Sherry & Salvador, 2002) or activity context over a series of communications between group members.

I am developing methods of representing this type of usage behaviour to assist communication between field researchers and design teams (see Section 2.4.3). The above data representations and the ability to quickly sort and triangulate between different data sources were invaluable to us while recreating scenes from the overall narrative.

Field Studies Versus Controlled Experiments

Several aspects of the study were controlled for practical reasons and several issues were specific to the environment used. These included restricting the communication medium, group size, creating an artificial (but common) activity, weather, and introducing a new communication technology. Limiting the communication mediums used was a practical decision to ensure comprehensive data logging and gain a detailed understanding of one technology. Presumably if other mediums such as mobile IM, group SMS, push-to-talk, Bluetooth chat, or mobile e-mail were available, users would choose amongst them in many complex ways. Many real-world constraints such as poor reception, low SIM credit, low batteries, high cost of voice/conference calls, and social norms requiring quiet often result in exclusive SMS usage amongst groups. Additionally, seeing the difficulties of using SMS in certain situations may provide more insight into why medium-switching occurs. We believe more studies of this would be useful. However, the ecological validity of the study was limited because of these issues and study designs should be critical of how many restrictions on natural behaviour are absolutely necessary.

The small sample size could indicate that some observations are not representative of a larger user population. However, even with more participants, context similarly cannot be controlled and different results would occur each time, reducing generalisation. It is also likely that interaction problems noticed by these users would be seen by other users, and that all problems discovered would be problems for some percentage of users of a popular product. The purpose of this formative study

was to inform future designers of potential in-situ problems, and is not controlled enough for detailed evaluative testing.

Using Reconstructions to Visualise Group Interaction

Reconstructions are similar to vignettes, which are a method of providing concise descriptions of observed behaviour and situations (Button, 1993). There were situations in the study where the complexity of group interaction and surrounding contextual issues made conveying a problem to an external audience difficult. As a result I developed visual and textual depictions of these situations which are called 'reconstructions' because of their similarity to crime scene reconstructions (Bevel & Gardner, 2001). These diagrams draw on storyboards used during filming of the original Star Wars movies which depicted 3D drawings, simple overhead views and a key differentiating between characters. They also bear some similarity to picture scenarios (Pedell, 2004) although reconstructions describe actual observed behaviour, use a different vantage point, and display different types of information.

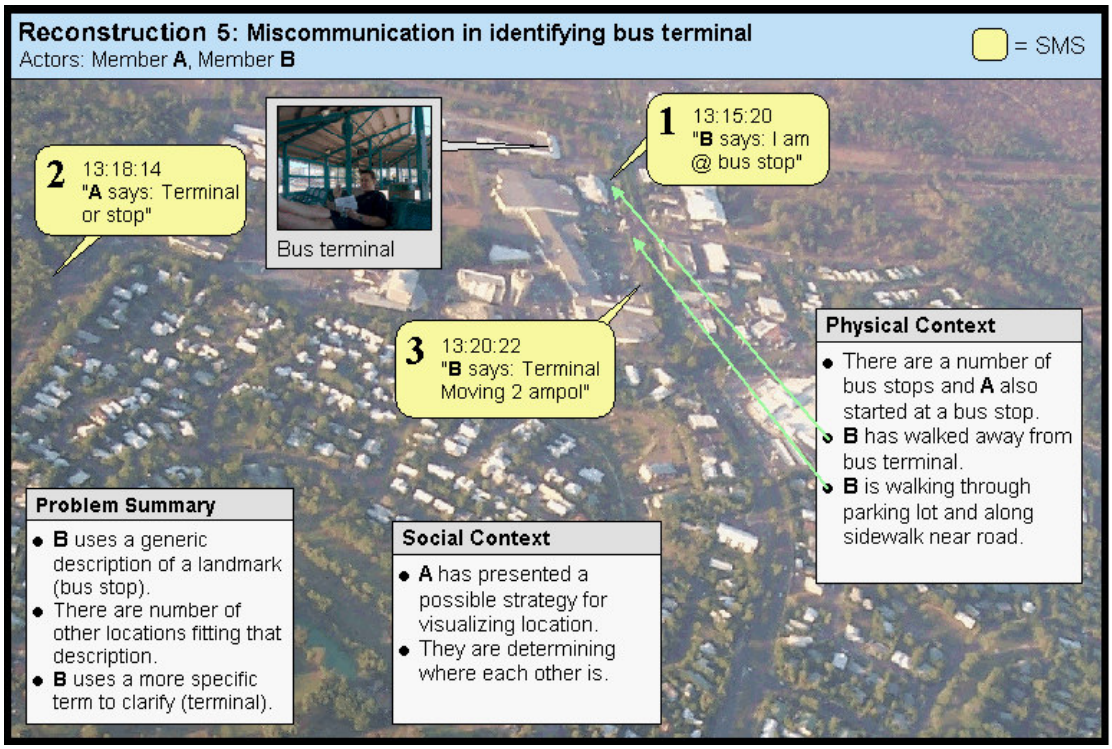


Figure 109: A non-specific term leads to a miscommunication and clarification between group members. Callouts and images from on the ground assist recreating the scene. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-4.4-reconstruction-1.gif

Depictions such as this can show where group communications had difficulties and the surrounding contextual influences that may have been a factor. For example in Figure 109 it can be seen that there are numerous bus stops and that landmarks are being used that are not visible to all parties. Similarly in Figure 110, as the compass bearing shows, the directions in instructions are incorrect and participants are not able to see each other to verify the intended recipient by gestures.

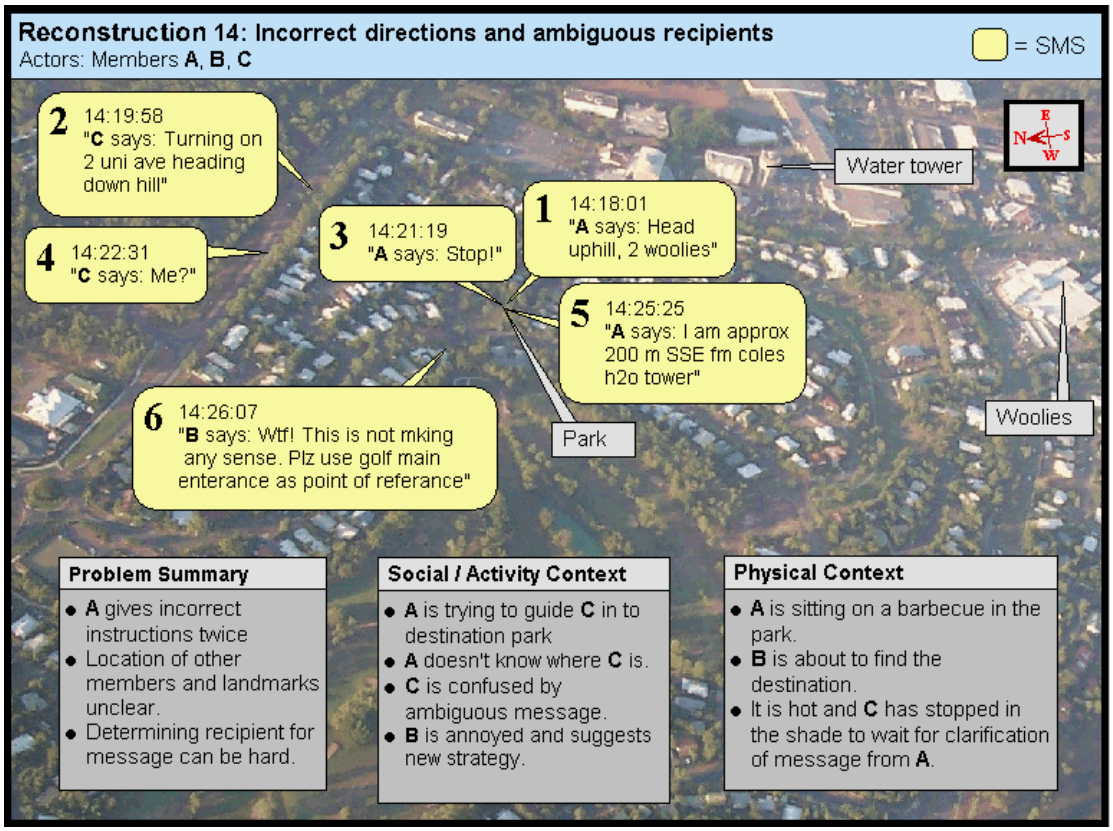


Figure 110: Incorrect instructions, vague location descriptions and unclear recipients lead to frustration of group member B. Actual locations and compass directions are marked. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-4.4-reconstruction-2.gif

It is also possible to use reconstructions to show the degree to which environmental issues are a concern. Figure 111 shows the multiple locations where an observer noted the presence of traffic influencing the participant's behaviour. While it is time consuming to generate these charts, it does provide a tangible way to investigate the particulars of a situation and then to convey them easily to others. We had the advantage of aerial photographs, but a photocopy of a street map and a quick sketch of important events with a pen would serve just as well in rapid-development situations. Electronic maps such as Google Maps could be another option.

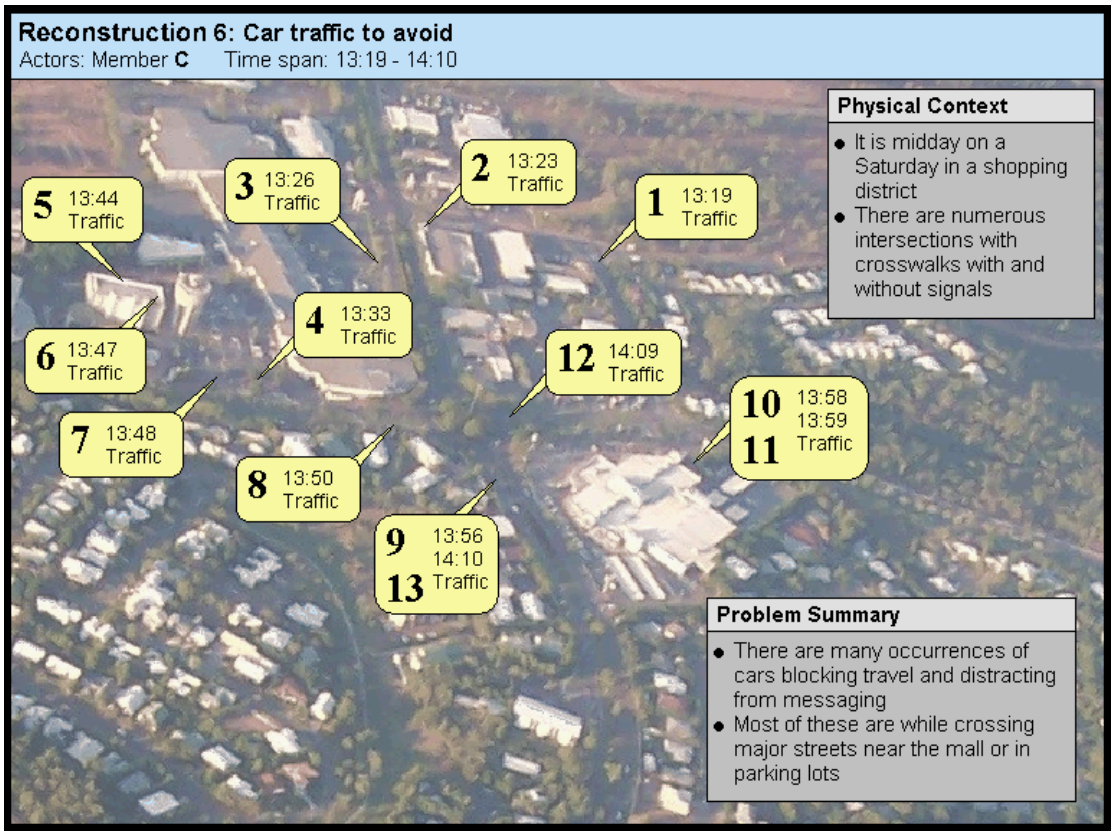


Figure 111: The potential problem of automobile traffic affecting the behaviour of a group member is noted. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-4.4-reconstruction-3.gif

4.4.1.3 Recommendations

The following are practical recommendations for structuring research:

- **Maps can have inaccurate scales for urban areas**, creating problems for applying GPS points or determining distances. Arial photographs may be more accurate and hand-drawn maps may provide sufficient semantic detail.
- **Automatic data collection** (particularly time-stamping) should be used to supplement qualitative observation techniques whenever possible. Methods for digital note-taking are needed.
- **Pictures can capture a great deal of mobile context** and may be faster to organize and review during analysis than video.
- **Use in-situ studies of prototype devices used by small groups** in specific situations which often provide needed insight into how they will realistically be used.

- **It is useful to capture data from all members of a group simultaneously** to gain knowledge of interaction affecting individual usage (see Section 2.6.5).
- **Apply existing methods in creative ways.** Studying users involved in extremely mobile situations is more difficult.
- **Many existing mobile methods do not work well for groups.** New methods need to be created to track all members of a group synchronously or asynchronously.
- **Reconstructions can help describe mobile group behaviour.** The source of interaction problems is not always obvious without a visual recreation of what actually occurred.

4.4.2 Mobile Information Sharing (MIS) Studies

The following sections briefly revisit the study method, which utilised field trips, and discusses practical issues and recommendations for its use. This method was structured both to observe naturally occurring mobile behaviour, but also to introduce new design prototypes into the mix. For a more detailed description of the method or results of the MIS study please see Sections 3.5.

4.4.2.1 Brief summary of method

A series of studies were run investigating mobile information sharing and social network formation amongst backpackers engaged in a typical tourist activity. Both studies are named ‘Mobile Information Sharing’ (MIS) with iterations 1 and 2. In each case, a group of six or seven backpackers was recruited from a hostel for each study. They participated in a day-long ‘field trip’ which included walking through the city, a boat cruise, and an animal park visit in Brisbane, Australia. In MIS-1 two observers accompanied the group, with one taking notes and the other using video. Three observers were used in MIS-2, with all observers taking notes and digital photographs. Digital audio-recorders (2 in MIS-1, 3 in MIS-2) were worn by volunteers in both studies for the duration of the field trip. In MIS-2, foam prototypes of mobile devices were carried and ‘used’ by backpackers during the trip (see Section 3.5.2.12). Workshops following the field trip debriefed the participants in both studies, and participants using prototypes had the opportunity to discuss modifications to them.

4.4.2.2 Reflection on method

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

In the first study the observers avoided introducing new topics. However it became clear that if questions were not posed to backpackers at opportune times, then valuable data would be lost. As a result, in MIS-2 active attempts were made by the researchers to ask about activities the participants were engaged in, or to elaborate about topics backpackers had briefly introduced. Early in MIS-2 it seemed that the prototypes were being ignored and the observers started to explicitly bring up the topic of “how they were doing with the prototype” to encourage thinking about design possibilities. This may have resulted in unrealistic expectations for future use (or non-use); however, the purpose of the study was to get participant perspectives on the designs, and it is possible that without minimal intervention very little of the primary purpose of the study would have been achieved. Thus, the desire for a sound and defensible study structure needs to be balanced with practical considerations of budget, time and design goals. Furthermore, known weaknesses of one study can be explored in additional studies using different methods (see Section 6.3).

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 could not form a group of six. The forms had to be redesigned the night before to accommodate an additional participant. Improvements in the study design could help, but we believe unpredictability is an inherent part of group studies. It is useful to design the study structure to be flexible to allow naturally occurring changes to be accommodated.

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

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

It was determined that video was most useful for watching single people, in quiet environments, where details of movement are critical. Individual digital audio recorders recorded single participants and often their conversational partner as well, depending on how noisy the environment is. First-person observations provide a good understanding of social issues, broader environmental situations and some movement issues. Using more observers enabled the recording of multiple perspectives and increased the probability of being able to track distributed groups. However this increased group size and awkwardness. More audio recorders captured talk and conversation from more individuals, but added significant analysis time. However, they do not add distraction for external parties, such as the video cameras caused.

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

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

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, I 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.

The results of the MIS study have demonstrated 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; and *common occurrences* indicate what will often be useful. It is notable that it was difficult to find 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. At least 184 observations falling into the above categories were recorded in this study. Each category is briefly described 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 on 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 photograph. 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 yoghurt, 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.

Please also see Section 6.4 for further discussion of situations of consequence and requirements elicitation.

Finding the Right Level of Structure

As mentioned in the method section (see Section 3.5.1), it is a challenge to provide a sufficient level of scaffolding for users so that they can contribute design ideas, 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 is more likely to draw comments about shape, weight and possible functions. Similarly, a plastic device with working buttons and screen is more likely to 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 in the design process seek to evaluate more specific design concepts that have already proved their worth in earlier evaluation settings. See Houde and Hill's paper on prototyping for an excellent discussion of these issues (Houde & Hill, 1997).

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, a number of issues were noted that would affect how the prototype is perceived and used by participants (see Table 7). The terms high, medium, low are subjective ratings approximating how significant or advanced the level of each aspect is.

Changing the level of any of these aspects would have had some effect on how backpackers perceived it. For example, functionality descriptions could have not been provided to backpackers. This would probably have left many backpackers unclear concerning what the device could be used for; it also 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 high ecological validity reduced the ability to explore prototypes with a low level of visual finish.

Table 7: Methodological Issues Affecting Prototype Evaluations

Prototype Issue	Example from MIS-2 (rated High, Medium, Low)
1) Level of interaction supported	**LOW**
How much detail is provided which directs how users interact with the prototype?	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.
2) Level of visual finish	**LOW**
How “final” does the product look?	We wanted simple objects which participants would feel comfortable modifying. We received feedback that some of them looked too ugly to wear in public.
3) Level of predefining functions	**LOW**
Has the purpose and capabilities of the prototype been conveyed to the user?	We provided users with a high-level description of a function, but allowed them to add new ones as desired.
4) Level of functional detail	**LOW**
Has the method of performing functions (e.g. steps) been conveyed to the user or restricted?	We provided no guidance as to how or where functions should be used.
5) Level of ecological validity (physical, social, activity)	**HIGH**
How realistic is the context or environment where the study is taking place?	With the exception of observers and recording equipment, and minor directions, the environment was typical for this type of activity.

6) Level of ecological generality (physical, social, activity)	**MEDIUM**
How typical or easily generalised is the context or environment where the study is taking place?	Backpackers do many other types of activities; however many do involve group transit, walking and park visits. This study is partially able to be generalised.
7) Level of naturalness of providing feedback	**MEDIUM**
How much does the method of conveying feedback about the prototype to the experimenter distract them from normal usage?	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.

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 pens. 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 problems. 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. These findings are relevant for the field of participatory design (see Section 2.5.3).

It is difficult to offer any general rules about how these issues should be dealt with because every study has a different purpose, stages, and situation-specific situations. 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-emphasise ecological concerns and focus on higher levels of interaction, visual finish and functional detail later in the development cycle.

Ethnographic Data Collection and Analysis

The amount of data resulting from three full-day audio recordings in MIS-2, three observer accounts, regular digital camera photographs, 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. Also, 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 112: 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[31] and could be integrated with a mobile display to enable typing (see Figure 112 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, organised temporally (see Figure 108). This was demonstrated to be effective in a previous study which used three observers and needed to compare simultaneous behaviour of different participants (Axup et al., 2005; Bidwell & Axup, 2005) (also see the previous Section 4.4.1).

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

4.4.2.3 Recommendations

Based on experiences using the field trips, the following advice is offered for others using them to study mobile groups:

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

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

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

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

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

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

- **Observe before intervening**. MIS-1 was a naturalistic observation. This enabled us to see what the effects of the prototype introduction were in MIS-2. Additionally, it was the analysis of naturally occurring issues in MIS-1 that informed

development of the prototypes for MIS-2. New technologies always change the target environment; it is useful to know how it is changing.

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

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

- **'Situations of consequence' are of special interest to mobile device designers** looking to utilise the results of ethnographic work (see Section 4.4.2.2). These include: questions, problems, fun, desire, intent, and routine occurrences. Watching for these categories of observations can expedite analysis and help focus on design-related results.

4.4.3 Method Template

Method Template: Field Trip

Rationale

The primary aim of a field trip is to get a group of people out in a reasonably natural environment doing a typical activity. Group interaction behaviour can then be observed, with or without technology interventions.

Preparation

Find a group of around six people willing to take an hour or longer to go outside to do an activity. If possible, audio-record some of their behaviour (many MP3 players have voice recording capabilities and can be worn around necks). Take a notepad and a small backpack with necessities such as water, rain coat, sun hat, etc. If desired, produce simple prototypes or use existing objects (e.g. a matchbox). Give participants a small list of fictional functionalities that they can choose for their device throughout the day. If possible, use two or three observers.

Activity

Ensure that the participants are able to engage in the intended activity and then let them do what they want. If needed, periodically ask participants to reflect on how they might want to use their prototype.

What To Look For

Behaviour that is of interest to the researcher can change depending on the design goals and the activity or participants being observed. Always watch for the unexpected. However, issues likely to be of interest include: communication, social interaction, decision making, effects of surrounding environments, sub-activities done, problems experienced and expressed desires.

Afterwards

Do a short debrief with participants about what they thought of the study and what situations they would like to use their device in. Review some of the audio and note conversations that occur away from the group and other observers. It may be useful to conduct interviews concerning prototypes in stable settings and record video.

4.5 Method: Social Pairing Exercise

The following sections briefly revisit the method of the social pairing exercise, and discuss practical issues and recommendations for its use. This method was primarily designed to explore a low-fidelity role prototype of a social pairing system in a stable environment. For a more detailed description of the method or results of the study please see Section 3.6.

4.5.1 Brief Summary of Method

Two iterations of an activity exploring the utility of externally imposed matching systems was conducted in conjunction with the MIS studies (see next section). Backpackers were paired with others in the group who they had an affinity with. For example, BP5 (Backpacker 5) had recently been surfing in Byron Bay and BP6 intended to travel there, providing a uni-directional social tie. They were asked to spend roughly five minutes talking to each of the one to three people they had been paired with. For each topic, backpackers filled out a short form which asked if the topic had been discussed previously and how useful the discussion was. One researcher then led a discussion of the utility of the automatic pairings between group members. This was followed by a short discussion about trust of travel information and possible uses for an information sharing system between backpackers.

4.5.2 Reflection on Method

The first session yielded qualitative responses which were recorded via audio and notes. The second session was similar, but allowed analysis of the forms to determine rough quantitative estimates. This data was reviewed to determine missed opportunities for information exchange, which consisted of information backpackers had indicated they wanted or needed, but which were not discussed. It also allowed analysis of which types of questions received high or low subjective ratings. The audio was very difficult to record as it entailed three simultaneous conversations. In the first session we tried placing audio recorders in a central location, which did not produce usable results. In the second session we left the three recorders on the participants who had been carrying them during the previous field trip. This produced marginally better results, but some discussions were between people not carrying microphones and there was background street noise and hostel announcements.

Audio for the focus group was also poor and we intend to use a larger external microphone in the future.

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

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

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

4.5.3 Recommendations

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

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

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

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

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

4.5.4 Method Template

Method Template: Social Pairing Exercise

Rationale

The aim of the method is to find pairings between people related to a certain activity or purpose and examine the utility of a future pairing system. It also elicits requirements surrounding the pairing process and social considerations.

Preparation

Find a group of people who do similar activities or roles. Examples include: parents with children in childcare, students commuting to university, or singles looking for dates. If possible, do the study in a natural environment for the activity. A day before the study, have them write down relevant characteristics about themselves. Prepare pairing cards that list up to three pairings for each person and a rating system for each one. If possible, place individual audio recorders on several participants.

Activity

Give each participant a card showing pairings between themselves and others in the group. Ask them to spend 5 or 10 minutes talking with each of their assigned pairs and rate the pairing after each one. An observer can skip between pairs, listening in.

What To Look For

Very low or very high ratings on utility for a pairing are interesting. Anything that sparks emotion is worth noting.

Afterwards

Lead a short discussion about what people rated as high or low and why. Ask about why people would want to be paired, and if other types of pairings would be useful. Ask for circumstances where pairings would be appropriate. If possible record this on video.

4.6 Method: Contextual Postcards

The following sections briefly revisit the study method: contextual postcards, and discuss practical issues and recommendations for its use. The method was primarily structured to provide a sample of the in-situ experiences of distributed members of the backpacker community. For a more detailed description of the method or results of the study please see Section 3.7.

4.6.1 Brief Summary of Method

The study was intended to canvas a range of Australian cities and determine relevant design issues for a mobile travel assistant. A primary research goal was to determine relevant usage situations and use these to elicit situated design problems backpackers were currently experiencing. Short “contextual questionnaires” with four demographic questions and three open-ended design questions were printed on 700 postcards, which were distributed to seven Australian hostels. An example question is “How did you find out about your present location before you decided to come here?” Hostels were originally contacted by e-mail to determine willingness to participate. Those who responded positively were sent a package of 100 postcards and instructions on how to distribute them. Hostel staff were requested to hand out one postcard to each guest, until all postcards had been used. Backpackers were requested to mail the post-paid cards after completing them.

4.6.2 Reflection on Methods

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

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

with loads of other leaflets. They grabbed my attention mainly because I had studied Computer Engineering at Birmingham Uni. Here in the UK, and I guess what you are researching does genuinely interest me! I had no problems in filling out the form. Although my inability to write was my major problem. :o)

This account indicates that self-selection may have been an issue and that distribution was a significant problem. It also shows the circumstances in which the cards may have been filled out in. We believe that lack of incentives for hostel staff and lack of face-to-face interaction with hostel staff and respondents were the primary causes of the low response rate. Responses were roughly of two varieties: the jocular response, sometimes provocative and understandably incorporating the study materials into their current holiday-oriented mindset, and the serious response, describing difficulties and concerns. An example of the first is a backpacker in the red light district of Sydney who said “If you can not get a room to yourself, take her in the fire exit.” A more serious response came from a backpacker worried about the quality of tours. “Do not sign up for expensive ‘tours’ w/out investigating public services such as transportation (buses, trains, ferries) and concession prices.” Both types of responses seem informative for design as they show emotion, attitudes, problems and needs of the respondents. We are pleased to find that even serious questions did not hamper some backpackers’ effectiveness at giving absurd answers and having fun with the process.

4.6.3 Recommendations

Based on my experiences using contextual postcards, I offer the following advice for others using them to study mobile groups:

- **Keep the questions simple and open-ended.** Certain topics will be of interest, but it is not designed for statistical analysis. The goal is to encourage unexpected answers, personal bias (by respondents) and ideas which challenge designers’ pre-conceptions of the design situation. This contrasts with questionnaire design which often advocates focussed questions (Helander et al., 1997, p. 697). We agree with Gaver et al, that supporting the unexpected is desirable (Gaver, W. W. et al., 2004). We also believe that designer intuition should be embraced by probing specific areas of interest, which are more likely to produce useful design material than untargeted questions.

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

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

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

4.6.4 Method Template

Method Template: Contextual Postcards

Rationale

The aim of the method is to understand people's relation to their current situation or environment. It also samples a variety of locations amongst distributed groups.

Preparation

Determine an aspect of interest about how people relate to their environment. Examples include: enjoyment of architecture in the city, perception of safety, or current family issues. Develop postcards which can be handed back to you after they are filled out (or post-paid stamps in a more advanced study). If relevant, ask a few demographic questions, but primarily focus on short, open-ended questions that ask about the participant's current situation. Ask about the objects they can currently see, their current social relationships, or their current problems. Be wary of asking them to predict the future; ask them about what they know, using their own language. Try to elicit the unexpected.

Activity

Go to a location relevant for the activity or situation being studied. Hand out the postcards to people in the environment and ask them to fill them out and return them.

What To Look For

Anything that people feel strongly about is interesting. Look for unexpected requirements relevant to design. Determine what issues are important to the participants and which are not. Find interesting areas for more focused studies.

Afterwards

Look for larger trends in responses and issues that are relevant to many people.

4.7 Method: Electronic and Paper Travel Diaries

The following sections briefly revisit the study method: diaries, and discuss practical issues and recommendations for its use. This method proved useful both in getting a high level sample of community behaviour, and also in observing details of the travel behaviour of individual backpackers. For a more detailed description of the method or results of the study please see Section 3.8.

4.7.1 Brief Summary Of Method

Initially a study design was chosen that is similar to traditional diary studies. One backpacker, and a pair of backpackers, were each given a paper journal to record their travels and those they met with. They were given pre-stamped envelopes to return the journals with. The backpackers were selected from those who took part in the contextual interviews and appeared responsible and interested. One diary was used to form a social network diagram showing people, location and activities. It was also used to develop a physical context chart for her travel route.
Additionally, a separate study reviewed travel web logs (blogs) which recorded pictures and narrative accounts of backpackers travelling over long periods (up to several years.) 4238 photographs documenting travel experiences have been reviewed for usage situations and group activities. The data is also being used to create social network diagrams and automated generation of vignettes.

4.7.2 Reflection On Method

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

As a result, we began looking for other ways backpackers had already recorded their travel experiences so that waiting for them to complete a diary would not be necessary. Travel blogs (e.g. travelpod.com) do exactly this and supplement it with

pictures and other contextual information. Research using this data could be considered an 'electronic diary study'. Using blog data has the advantage of allowing participants to be chosen after they have demonstrated how reliably they record their travels, and bloggers are used to their data being publicly available. Blogs offer in-situ discussion of events as they happen, in the context of a larger pattern of extended movement. Coding blog data for people, places, and other variables is time consuming, although there may be ways of automating portions of this.

4.7.2.1 Analysis of Blog Entries

Travel blogs are becoming so common that the number of travel blogs on a site necessitates the need for automated techniques if all blogs are to be reviewed. Some providers track variables such as dates and locations, but few record the identities of people whom backpackers meet and blog about. When manually analysing diary accounts it is simple to note the names of other travellers and their social connections with the blogger and others. However, it is more difficult to automate this. Manual tagging of diary entries rapidly becomes tedious due to the number of categories that are relevant and the lack of tools which support this process. This will reduce its utility as a data source in rapid-development environments. However, during the course of the analysis for this paper we have developed a prototype interface (see Figure 113) which would accelerate the coding process, and could be provided to backpackers to tag their own content as it is written. There is a great deal of content in blogs which is not coded in a fashion suitable for computers such as names of people, misspellings of locations and relative references to time (e.g. tomorrow, last week). Thus the chance to analyse, visualise or search this information to provide new tools for backpackers is limited. Advanced tagging services which enable new tools to be built have recently been popularised by Flickr[32], which encourages users to label photographs they upload.

Despite their limitations, many blog sites do have search engines which allow keyword queries across all of the blogs hosted. Searching for keywords such as 'scared', 'angry', 'bored', and 'typical' easily provides numerous short vignettes of the situations which result in these emotions or situations. These can provide stimulating design scenarios and ideas for technologies which could assist backpackers with their problems (see Figure 114). Instead of being hypothetical situations thought up

[32] www.flickr.com

by designers or marketing departments, they are rich accounts of actual experiences which emphasise issues that will be important to future users.

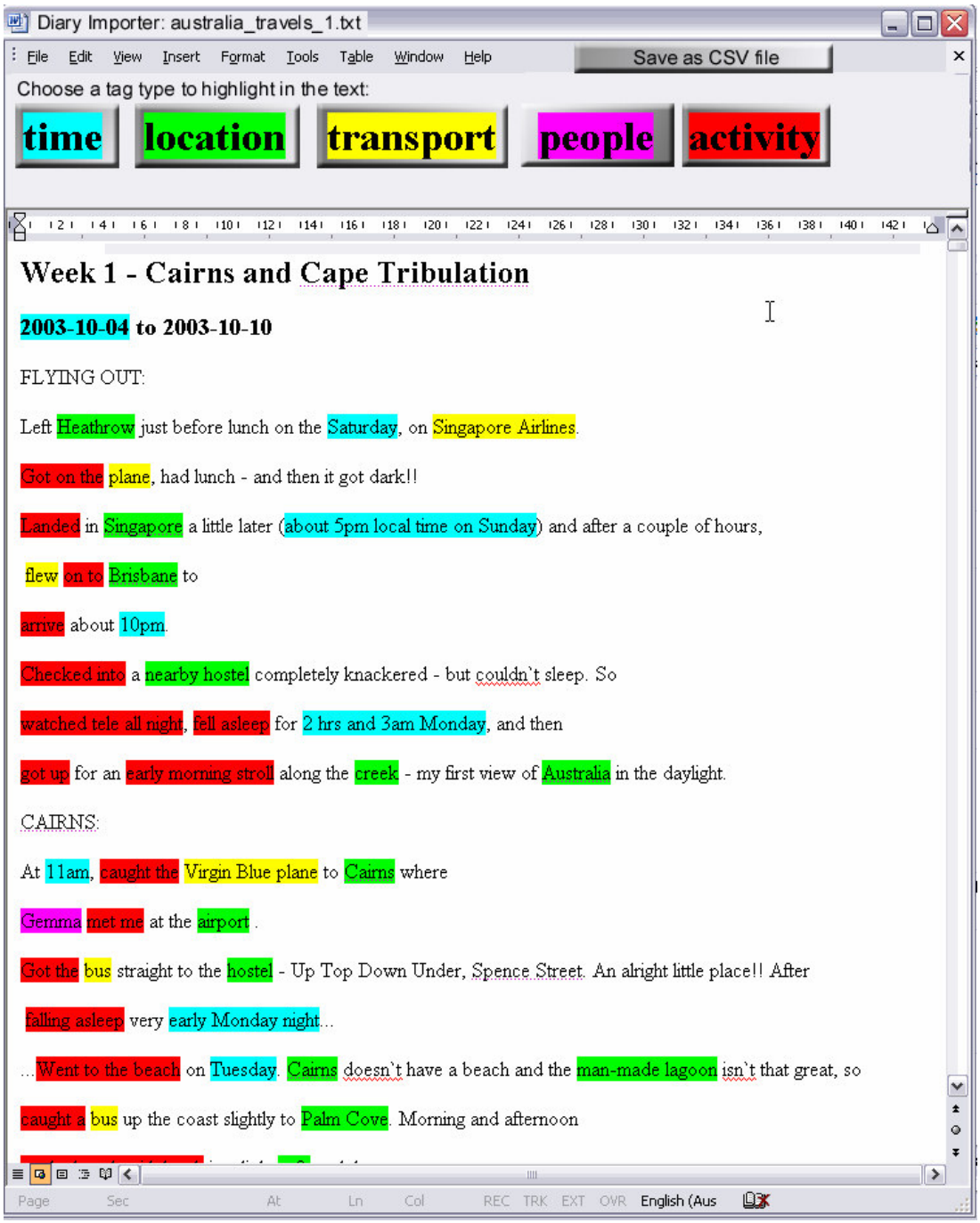


Figure 113: A prototype editor that would allow labelling of different content types to facilitate faster graph generation. A word can be selected and then labelled as time, location, transport, people, or activity by selecting a button at the top.

4.7.2.2 Applying Diary Results To Product Design

Previous research with backpackers has indicated that requirements and design ideas tend to come from the following categories of observations: questions,

problems, fun, desire, intent and common occurrences (see Section 4.4.2.2). The textual portions of diaries indicate some of the questions travellers have and many of the problems they experience. They also discuss things that are fun and sometimes goals or missed opportunities. They do not tend to focus on common occurrences, but sometimes this is discussed as part of the narrative. Photographs in blogs tend to focus on things that are fun or unusual. Photographs also infrequently document common experiences, and determining psychological or social issues such as intent and problematic situations is difficult in this medium. The textual and pictorial aspects of blogs collectively offer a way to study distributed travellers in a great level of detail, in relatively short periods of time.

Challenging situations can be described for the purposes of design in short vignettes (see Figure 114). Sometimes these border on being scenarios in that they incorporate fictional elements, usually to explain aspects of the situation which are not thoroughly explained in the original account.

In general, travel blogs offer rich auto-ethnographic accounts of travel which can be used to inform design. Data analysis is the most time-consuming part of this style of research and researchers must decide how much depth is needed and which areas are important to focus on. Pre-existing blogs present a challenge in that it is impossible to direct the type of data recorded, but this also enhances its credibility and naturalness. If atypical recordings of behaviour are needed then it may be necessary to find participants and proceed with more traditional diary studies. Blogs and diary studies are probably not the only method that could or should be used, but they do provide excellent data for certain types of design activities. Combining multiple methods is the only way to overcome individual deficiencies and gain a holistic understanding of behaviour (Mackay & Fayard, 1997).

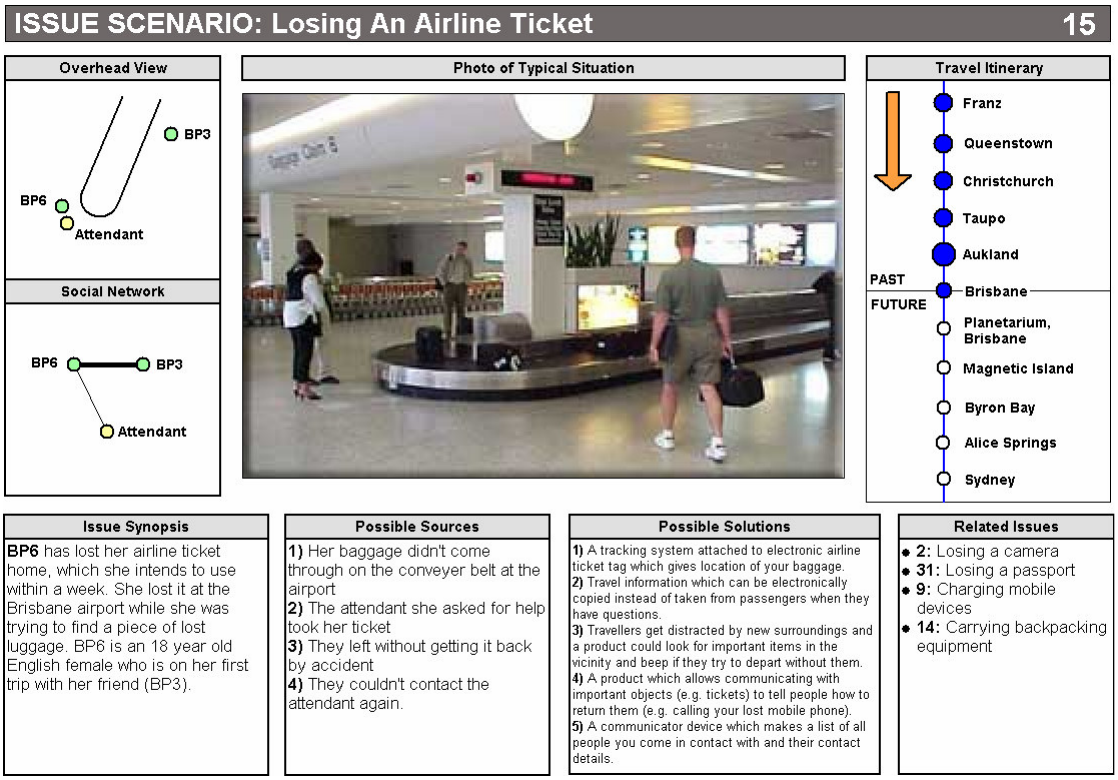


Figure 114: A scenario based on a real account of a backpacker losing her airline ticket at an airport. This results in a list of solutions to the problem in the social and physical context of the airport. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-4.7-scenario-1.jpg

4.7.3 Recommendations

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

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

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

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

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

- **Use tools to assist with coding and tagging** if they are available. Development of such a tool may not require significant development time.

- **Use visual scenarios to depict critical design situations.** Group perspectives can communicate the social and connected nature of many mobile usage situations.

4.7.4 Method Template

Method Template: Diary Study

Rationale

The aim of the method is to understand an aspect of longitudinal behaviour of an individual or group.

Preparation

Buy several small notebooks (preferably spiral-bound). Choose an aspect of behaviour that is of interest. Examples include: shopping locations and items, communication partners and mediums, or items carried with an individual. If it does not unnecessarily constrain the activity, pre-label the notebook pages with headings to remind participants what to record. Alternatively, conduct a post-hoc study and use diary materials that have already been created for other purposes (e.g. Internet discussion forums or blogs.)

Activity

Give the notebooks to participants and instruct them to keep notes for a day or two. Go through a scenario of writing in the journals before they start.

What To Look For

Look for patterns in behaviour. See if there is anything unexpected or unusual. Find notes that are unclear or confusing to the researcher. Look for issues relevant for design of devices for that situation.

Afterwards

If possible, do a short interview with each participant. Ask about anything that is confusing. Review the logs and ask the participant about the situations described.

4.8 Summary of Practical Use of Methods

The above sections have examined five different types of methods: site surveys and contextual interviews, field trips, social pairing exercises, contextual postcards, and diaries. These methods have been shown to have various strengths which can loosely be categorised as naturalistic observation (both reported and observed), prototype exploration (mobile and stable), and community sampling (see Table 6). Practical usage of each of these methods has been discussed in detail and recommendations made for further use of them. The following chapter briefly discusses some of the designs resulting from usage of these methods.

5 Additional Research Outcomes

The primary aim of the thesis research was to produce effective methods for designing to support mobile group behaviour; however while trialling these methods, product requirements and design ideas were developed, and industry partners provided feedback. Chapters 3 and 4 have already addressed the methodological contribution in detail. This chapter serves to briefly summarise the design outcomes in a concise fashion and discuss industry responses. A complete list of requirements (see Appendix B) and product ideas (see Appendix C) are included as appendices.

5.1 Design Outcomes

The studies which explicitly generated or evaluated product interfaces and concepts (MIS, Social Pairing Exercise) are the source of the designs in this section. These designs have already been reviewed in the results and discussion sections of their respective studies (see Sections 3.5 and 3.6.2) and are covered here as a summary. Some product concepts such as the handheld travel assistant shown in Figure 115 were not evaluated, but have been used in papers to show tangible results of requirements analysis research. In other cases, the method of *communicating the design* is shown along with the product design concept, such as the next section on tourism product concept sheets. The sections after it cover an interactive prototype, a social pairing system prototype, and the numerous mobile design concepts from the MIS studies.

Figure 115: A mock-up of a handheld travel assistant showing situational alerts and community authoring.

5.1.1 Tourism Product Concept Sheets

At times during the research we have partnered with Lonely Planet and TravelPod, and have received assistance and feedback from other companies. This section reviews some of the non-functional prototypes that have been developed and introduces a 'concept sheet' which I have iterated with industry partners to assist explanation of product concepts to them.

The product concept sheets are a way to take collections of product features, which resulted from user requirements (which came out of observations of users and their comments) and produce tangible product concepts. Each sheet is composed of a description of the product, proposed features that group together well, a picture of the interface, opportunities and competitors (see Figure 116 and Figure 117). These sheets draw on the concept of a SWOT analysis in business which reviews strengths, weaknesses, opportunities and threats for potential business ventures (Harvard Business School., 2005).

TOURISM PRODUCTS - CONCEPT 1

Purpose: Doing and planning activities

Description

The product helps the backpacker do what they want to do, and learn about what they can do. It tells them about events in the immediate area on a desired time frame, and indicates how much it will cost. It helps backpackers be as spontaneous as they want to be. Notifications provide timely updates of what is possible and current. It lets organizers spread the word to people who are interested and helps backpackers make events more fun by inviting others. Transport information supports these activities by giving users an idea of costs and an ability to choose activities appropriate for their budget.

Features

1. "I wanna do something now!"
Instantly accessible activities supporting spontaneity.

2. Cost Of A Travel Route
See how much others have recently spent between point A and B.

3. How can I get to ____?
Different routes and transport options to a given location.

4. Activities List
List of potential things that can be done in the immediate area.

5. Share the fun.
A way to tell people about amusing things in certain locations.

6. Announcements
Read official announcements for location.

7. Event Notification
Allow backpackers to choose to be notified of relevant location or activity relevant events.

Note: Above features could be sold as separate products and combined with features of other proposed products.

Opportunities

- Building community of product supporters
- Potential revenue streams from tourist operators and event planners seeking to advertise
- Many public transport systems already offer online itinerary planning systems to tie into
- Possibility of becoming the first-accessed service for backpackers doing travel planning
- Most competitors are web or paper based and not optimized for mobile & dynamic backpacking needs

Competitors

Most related services are paper or web-based. Most are run by one company and don't offer price comparisons.

- Lonely Planet, Let's Go Guidebooks
- City transit web sites
- Hostel information desks
- Notice board and bulletin boards
- Web discussion forums
- Greyhound bus flyers and websites
- Verbal gossip

This product idea results from research on the Communities and Places Project conducted by Jeff Axup and Stephen Viller.

Figure 116: A mobile device concept which helps determine how to estimate costs, plan a route, find information about a location and find friends to join in the fun. A larger version of this image is available at: share.userdesign.com/thesis/ under ch-5.1-product-concept-1.jpg

TOURISM PRODUCTS - CONCEPT 6

Purpose: Interact with others at this location

Description

This product connects the traveller with people in their immediate environment. Many difficulties stem from not being able to find information or resources people nearby can offer. When travellers run into problems, it allows them to find help or responsible people in the current environment. When travel experiences are enjoyable, it enables easily sharing them with others who can benefit from it. It enables visualization of friends nearby and at home, as well as nearby strangers who are of interest or have useful items. Concept 6 assists travellers to meet each other and exchange resources more easily.

Features

1. **Find a friendly local**
Locals have information travellers do not.

2. **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.

3. **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.

4. **Complaint + feedback**
Support giving feedback to those at current location.

5. **Check Out This Good Spot**
An easy way to tell other backpackers about a spot you really enjoy.

6. **People tracker**
Methods of seeing where others are.

7. **Work Finder**
Find available employment in current area and present time.

8. **Assistance Bell**
Rapidly contact staff at the current location for assistance.

Note: Above features could be sold as separate products and combined with features of other proposed products.

Opportunities

- Building community of product supporters
- Possible with existing bluetooth technology, GPS not needed for most features
- Potential revenue generator in work finder and finding sales people
- Features are highly integratable with other concept features, increasing stickyness
- Many travellers will use inexpensive products marketed directly to them via hostels or transit centers

Competitors

All similar products are MoSoSo oriented. They are not aimed at travellers and lack specific activity orientations.

- Dodgeball
- Crunkie
- MamJam
- cellphedia
- playbxt
- Buddyping

Figure 117: A mobile device concept which encourages face to face communication by helping the backpacker connect with locals, travellers in similar situations, facilitating swapping of possessions, job offers and keeping track of friends.
A larger version of this image is available at:
share.userdesign.com/thesis/ under ch-5.1-product-concept-6.jpg

These product sheets were presented to a project partner who expressed interest in some of the product features and provided constructive criticism on the layout and

content of the presentation format. In particular it was recommended that the sheets show more clearly the scenarios in which the device would be useful. This has resulted in a new design for presenting this material which is partially completed. Since this is not the primary purpose of the thesis, the new design has only been developed to the stage of the wireframe diagram shown here (see Figure 118). It may be useful for other researchers wishing to commercialise their product ideas.

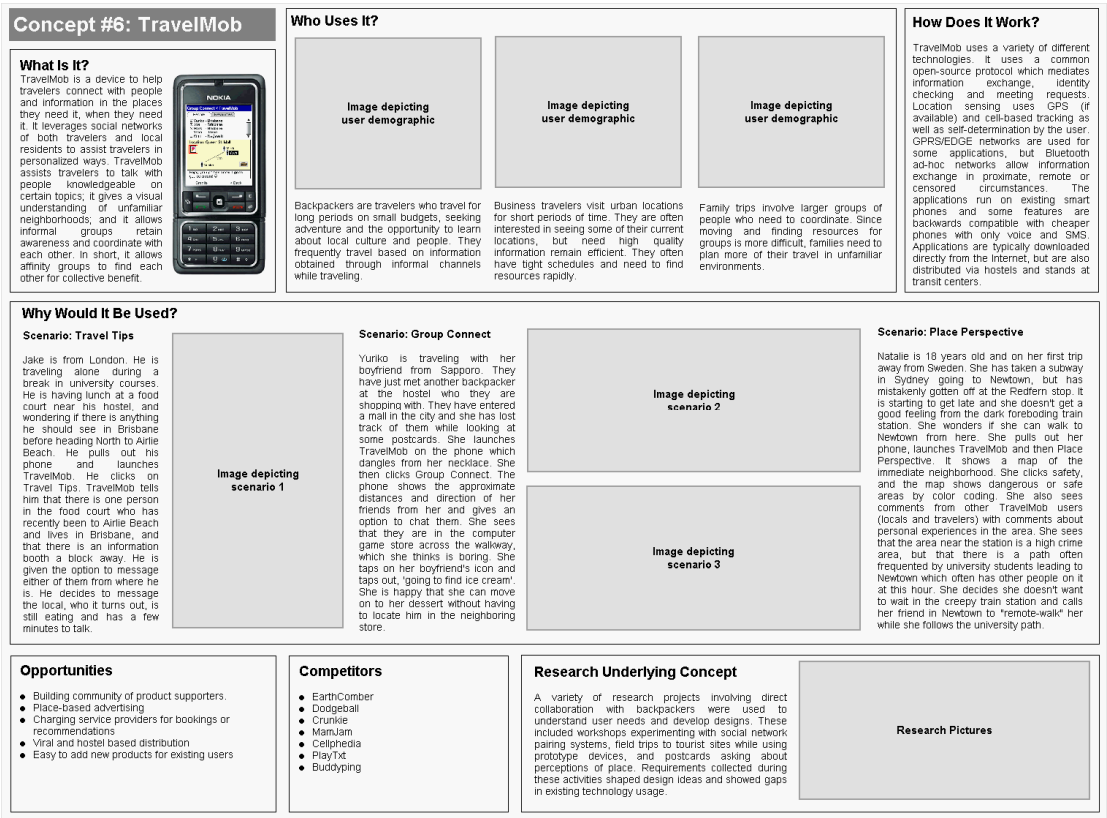


Figure 118: A wireframe layout for an improved design of the concept sheets.
A larger version of this image is available at:
share.userdesign.com/thesis/ under [ch-5.1-wire-layout.gif]

5.1.2 Phone-based Medium Fidelity Prototype

An interactive prototype was also developed to show what the functionality would be like to use on mobile phone hardware (see Figure 119). A hypothetical touch screen interface and functional buttons help depict how mobile group features could be used.

Figure 119: An interactive high-fidelity prototype demonstrating mobile group features. The interactive prototype is available at: share.userdesign.com/thesis/ under ch-5.1-phone-prototype.pcgi

5.1.3 Social Pairing System Role Prototype

The social network pairing exercise (see Section 3.6) did not have any explicit interface designs except for small sheets of paper indicating pairings between backpackers and rating systems. Thus it was primarily an interface-free simulation of a hypothetical future pairing system. Figure 120 shows the invisible interface of the pairing system held in a café in the backpackers' hostel. Figure 121 shows a naturally occurring social pairing system on the boat during MIS-1. In the first case, backpackers were purposefully paired based on affinities in their future and past travel routes. In the latter case, backpackers were talking about many topics, which included their future and past travel destinations, and formed a more complex pairing system.

Figure 120: The invisible interface to an artificial social pairing system.

Figure 121: The invisible interface to a natural social pairing system.

This produces an interesting case of a product design which does not have an interface or a tangible way of perceiving it. Thus it is the underlying functions and interaction which are evaluated and not the interface itself. Using observations of natural systems and applying them to very basic simulations held in familiar locations provides increased ecological validity and avoids unnecessary focus on advanced

interfaces. It may be that this type of product evaluation, and perhaps product design, are useful goals for development efforts.

5.1.4 Product Concepts From MIS

While the MIS product concepts have already been introduced in the study results (see Section 3.5.2.12), it may be useful for a concise review of the product concepts and features.

"I can find someone who wants to buy something you have."
(wrist mounted form factor, similar to large sport watches)

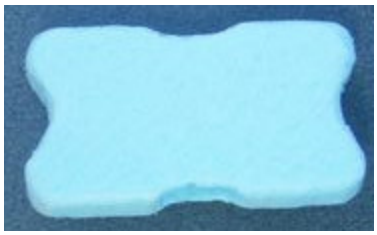
"I can tell you the cheapest way to do something."
(small flat angled form factor, similar to small mobile phones)

"I can show you the location of other group members."
(small flat circle form factor, similar to a pocket mirror)

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

“I can tell people whom you choose what you are doing now.”
(very small thin box form factor, similar to key fob USB storage devices)

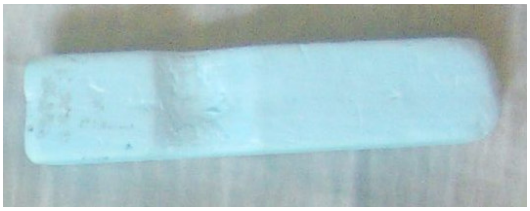
“You can talk to the group using this device; I can show you where you are.”
(large thick panel form factor, similar to Apple Newton or small tablets)



“I can tell you what other backpackers thought about something.”
(small flat irregular form factor, exploring different pocketable shapes)

“I can find any object for you.”
(small flat bell shape on lanyard, exploring bracelets)

“Ask me where to find people who know about something.”
(medium flat form factor with large hole, exploring see-through screen and larger space for input methods)



“I can identify any object.”
(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."
(small flat triangle form factor, exploring triangles and necklaces)

"I can let you talk to anyone in the world for free."
(medium curving flat form factor with hole, exploring curves and hangable/attachable affordance)

Some of the above 'devices' were evaluated by users and received positive feedback. However, some designs were not selected by backpackers, and others which were chosen were not appreciated or used during normal tourist activities. This does not necessarily mean that any of the designs are good, bad or worth developing. Rather it gives clues into which features are used in what situations, how backpackers would respond to new technologies, and insight into how prototypes can be used by participants to produce informative results.

5.2 Industry Response

Portions of the research have involved a number of industry partners that have assisted the research in various ways. Each of these businesses is listed below with a short summary of their contribution and response to the research.

ACID - www.interactiondesign.com.au

The Australasian CRC for Interaction Design (ACID) has partially funded this research. They have shown an interest in utilising the research methods developed in this research in their future development projects.

Lonely Planet - www.lonelyplanet.com

A marketing manager from Lonely Planet took part in the MIS-2 study and the CEO, Judy Slatyer has expressed a continued interest collaborating on our research with backpackers.

Palace Backpackers - www.palacebackpackers.com.au

The manager of the Palace Backpackers assisted with recruiting and provided a location to run the workshops. She has expressed an interest in learning more about backpackers' requirements and future travel technologies.

TravelPod - www.travelpod.com

TravelPod runs a web service which hosts travel blogs, which is primarily used by backpackers. They provided the database used to generate one of the graphs and some of their users' blogs were reviewed. They have expressed an interest in further development of the graphs as a commercial product.

5.3 Summary of Research Outcomes

The above product concepts have explored a variety of different design possibilities for backpackers. They help demonstrate the utility and outcomes of using the methods described in Chapter 4. Requirements resulting from observations of backpackers, combined with exploration of emerging technologies formed a foundation for the designs. The product concepts were evaluated by backpackers in realistic environments. The evaluation method used in MIS was original because groups were simultaneously using the devices during natural mobile activities. The evaluation method used for the social pairing system was novel because it did not have an interface, and consequently was able to focus on underlying system functions. All of the prototypes are low-fidelity, which allowed rapid construction, modification and evaluation without much expense of time or money. Having passed an initial stage of concept evaluation, many of the ideas are suitable for more advanced evaluation with higher-fidelity prototypes for eventual production. The projects research partners have demonstrated interested in the research and in the designs and research methods coming out of it.

6 Discussion

This chapter addresses concepts which are broader than any of the individual studies conducted. In particular these topics relate to mobility research, method usage, and the social impact of mobile technologies. Parts of this chapter also address theoretical issues or recommendations that I am making based on the research previously presented. This chapter also seeks to address a number of the challenges identified as part of the Research Question (see Section 1.1), which are referenced as appropriate below.

The chapter begins with a discussion of how applicable mobile and CSCW methods are for studying the emerging area of mobile groups. This offers theoretical background for the methods chosen and presented in Chapter 3 (addresses Section 1.1, A, F). This is followed by advice on how to choose from available methods. Five different methods were used in this research, and the experience of selecting these methods, adapting them, and creating new ones is offered (addresses Section 1.1, B,C). Subsequent to this, there is a discussion of the utility of using triangulation to incorporate multiple qualitative methods. Use of multiple methods in this research has enabled comparison and increased understanding (addresses Section 1.1, B). Following this, ethnography is discussed as being a useful tool for generation of requirements and product concepts (addresses Section 1.1, D, E). This addresses concerns about how ethnography should be used in a design process and the utility of doing so (also see Section 2.5.2). Ethnographic observations from interviews and the MIS study are reviewed to demonstrate requirements generation. This is followed by a review of the use of visual representations for conveying requirements and design ideas. Examples of diagrams and maps from the studies are demonstrated and discussed (addresses Section 1.1, D). This provides a broader perspective on why visual methods of depicting group behaviour aid design processes Following this is a review of the theoretical advantages and disadvantages of in-situ methods, with examples from the backpacker projects (addresses Section 1.1, D). The discussion chapter closes with a tentative exploration of how design theory indirectly influences the lives of technology users, how we should choose our methods, and what type of social changes we should be encouraging with our designs (addresses Section 1.1,

G). This section draws an analogy to the English textile workers in the Industrial Revolution and provides examples from contemporary backpacker culture and this research.

6.1 Applicability of Mobile and CSCW Methods for Mobile Groups

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

CSCW typically uses methods applicable to stable collocated users, although some groupware systems analyse stable distributed users (Erickson & Kellogg, 2002; Leinonen et al., 2005; Weilenmann, 2001a) and frameworks for understanding distribution of group work exist (Viller & Sommerville, 1999a). These methods often focus on different aspects of the environment and behaviour than are relevant for mobility studies. They also primarily concentrate on *work*, which only has partial utility when designing for *fun*. Consequently it has been argued that ‘work’ is now generally assumed to encompass play, domestic life, etc. and that CSCW may need to broaden its focus to other types of group interaction (Crabtree et al., 2005; Twidale et al., 2005).

Mobile groups are particularly challenging for these research methods. Groups can disperse and are difficult to observe (Weilenmann, 2001a) (see Section 4.4.1.2). Participants can move for long periods of time and they are immersed in rapidly changing social situations. Furthermore, they regularly experience different kinds of mobility with differing levels of stability, and often pause movement irregularly (see Section 3.5.2.5). The methods listed in Chapter 3 are intended as starting points for the generation of new exploratory methods which are more appropriate for mobile group development projects. They will undoubtedly need adaptation to fit different physical and social circumstances, and study aims.

6.2 How to Choose Appropriate Methods

Methods have different strengths and weaknesses, work better or worse in certain social settings and fit some research questions better than others. This was found to be the case while constructing methods (see Chapter 4) for studying backpackers in hostels, on group tourist activities and while on the road. Lofland and Lofland advise that "Some settings or aspects of social life are easier to research than others. Gathering rich data through observation in open public settings can usually be accomplished with a minimum of misadventure." (Lofland & Lofland, 1995, p.25) This thesis argues that choosing methods from a wide variety of options and then adapting them to fit the situation should be a standard activity which helps to decrease the likelihood of misadventure in mobile research.

Particularly challenging situations often produce opportunities for creating new methods, or significant changes to existing methods. New technologies (e.g. digital audio recorders capable of recording a full day, or travel blogs) offer the ability to run studies differently. I have found that predicting the limitations of existing methods in a new setting is very difficult. For example, methods failed us for a variety of reasons including: little incentive to participate, transgression of social norms, lack of quality results under the circumstances, and use of improper supporting technologies. Determining how a method will combine with unknown participant characteristics, environment, culture, equipment, and possibly group dynamics is infeasible.

Consequently, piloting methods on a small scale in untested environments is often a good idea before larger studies are conducted. Even if a pilot of a method fails, it usually produces interesting results. The social network board failed (in our research setting) because backpacker networks were more dynamic than expected (see Section 3.4.1). This was not well understood before trialling the method. Since the method consisted of a piece of foam-core and sticky-notes, the minimal time and expense lost was well worth the lesson we learned about our intended users.

6.3 Triangulation Using Different Methods

Historically, triangulation has meant a trigonometric process of using lengths and angles of a triangle to determine distance (Gossett, 1959). This distance can be used to determine location by satellites, and guide ship navigation or weapons guidance systems. Thus it is a method of using multiple measurements to gain new knowledge

about the environment. In the social sciences, triangulation is used to indicate the use of multiple methods used in combination to verify results from multiple sources. Triangulation can support methods which have different strengths and weaknesses; when used in combination they produce a more complete picture and contribute to verification of findings (McGrath, Martin, & Kulka, 1982). A common issue in design is how to determine the significance of findings about behaviour. For example, one user might have a specific need, but it is unclear how many others do. This relates to how significant the issue is. If other users in different situations can be sampled, and there are similar findings, then the design team's confidence in weighting that issue above other competing issues is increased.

In their review of a variety of research studies conducted by CENA while researching the French air traffic control system, Mackay and Fayard discuss the benefits of using multiple methods (Mackay & Fayard, 1997). They give examples of studies which used both deductive and inductive models and quantitative and qualitative evaluation methods. They indicate that "It is simply not possible to use a single study that addresses all the possible threats to validity. The solution is triangulation: using more than one research approach to address the same question." (Mackay & Fayard, 1997, p. 231) They argue that using methods from different disciplines, and thus potentially use radically different methods and perspectives, is more likely to be beneficial. It has similarly been argued that ethnomethodologists in CSCW should diversify their theoretical and methodological approach to be more effective (Shapiro, 1994). Mackay and Fayard also indicate that individual researchers are not likely to have the expertise to conduct a wide range of studies. This depends, however, on the range and complexity of the methods being used and the purpose of studies being conducted. Explorative research (see Section 2.5.6) which targets early portions of the development cycle does not typically use quantitative methods because of the focus on larger issues in uncontrolled environments. Thus it may be the case that multiple *qualitative methods* can be used for effective triangulation early in the development cycle. This has also been used effectively in other explorative mobile device research (Carroll et al., 2002). The variety of methods used in this thesis present a case study for this approach.

My research with backpackers has used five different qualitative methods which were all conducted by the same researcher. These were: 1) interviews and site surveys, 2) field trips, 3) social pairing exercises, 4) contextual postcards, and 5) blog and diary studies (see Section 4 for details). These methods were used to explore different

levels of ‘participant structure’ and ‘duration of interaction’ and to balance the advantages and disadvantages of the methods, as has already been discussed in Section 3.2. Interviews and site studies were used early to provide a high-level understanding of the design space and determine relevant issues. Field trips provided an understanding of detailed communication habits during naturalistic group activities. The social pairing exercises extended this by looking at behaviour using a very simple prototype system. The contextual postcards looked at community activity from a broader perspective which gained feedback from backpackers in different locations and circumstances. The blog and diary studies investigated the social structure of backpackers as they travel and expanded the scope to hundreds of backpackers travelling worldwide. Thus, different methods supported multiple viewpoints on community interaction and needs, which could not have been gained with a single method. The qualitative nature of all of the studies made it easier to run effective smaller studies, with lower costs and time commitments. This data was less certain than quantitative studies would have provided, but quantitative studies would not have known what variables were important enough to structure studies around, and would have run the risk of inappropriate structure.

The results from a study using one method were often useful for understanding the results from other studies using other methods. For example, pictures of backpackers taking boat trips in blogs had implications which were much clearer after having taken a group of backpackers on a boat excursion field trip. Similarly, the behaviour observed during the social network pairing exercise made more sense after having observed backpackers pairing naturally on the field trip. On the other hand, the results of one method can show missing data in another. Photographs in blogs did not tend to depict hostels or accommodation, and yet we knew from backpacker interviews that dealing with finding appropriate accommodation occurs regularly and can be a significant source of anxiety at times. Likewise, the results of the contextual postcard questionnaires revealed some distinctly sexual themes which did not come up in interviews or in photographs on blogs. This makes it apparent that there is a patchwork of different types of data which are pieced together by different methods.

The most important aspect of triangulating the studies was determination of significant variables. One backpacker when interviewed had mentioned the difficulty in trusting the advice of a travel agent. This seemed like a minor issue until I also received postcards with backpackers vehemently complaining about being sold useless tours, and backpackers on the field trips talked about how trustworthy hostel

notice boards were. These combined responses underscored the importance backpackers place on reputation and sampling multiple opinions. One study alone with this result might not have seemed credible or important, but three different studies, with different users, in different locations, being contacted in different ways, who all mentioned the same concept, lends a great deal of credence and depth to it. This not only provides a designer with the knowledge of what is significant, but helps them to understand multiple facets of the issue.

It has proven to be very useful in this work to triangulate between different qualitative methods. Particularly early in development processes this can provide a wide range of data to help understand a design space. As specific areas of interest are found, it makes more sense to iterate on a particular method to delve into the details. Iteration offers its own form of triangulation between new and old study results, which is also useful.

6.4 Use of Ethnography to Form Requirements and Product Concepts

Ethnography and other social science methods are now commonly advocated in the CSCW community as a way to improve the quality of requirements engineering processes (Anderson, 1994). However, there is still considerable debate over how knowledge should make its way from the field and into the designs that are built for the people in it (see Section 2.5.2). Possible solutions include having ethnographers talk with designers, ethnographic records being used by designers, formal methods of describing the field, and having designers do fieldwork (Button & Dourish, 1996; Viller & Sommerville, 1999b). The backpacker research has both utilised designers doing ethnographic work as well as looked for opportunities to develop tools and depictions to assist communication and analysis. Finding methods to externalise experiences from the field (see next section) is particularly important in team ethnography (see Section 2.5.2) where there are multiple perspectives of the same situation which need to be combined. Similarly, when studying groups, describing interaction between multiple group members can be difficult without visualisations.

A related problem in design research is understanding what aspects of a situation are useful for design. Traditionally, ethnography was a description of natural behaviour in a setting, preferably in a way that could communicate the perspective of those

studied to an external audience. However, because of the realities of commercial product development, we now have designers in the field doing rapid ethnography. With long duration studies being unrealistic, it is necessary to focus available time on observation of areas that are likely to be relevant for design. For example in the MIS Study, we only had one day for each iteration due to constraints of budget, available researchers, and support of gatekeepers. Additionally, because of our goal to design mobile technologies, we took care to note use of existing travel technologies, and record aspects of the environment which were affecting device usage. While this focus did limit what we recorded to some degree, it also ensured that what we did record had a high probability of relevance.

The case can also be made that use of design-relevant taxonomies during data analysis is useful. In the TIM study (see Section 4.4.1), custom HTML interfaces were used to assist review of the data. The interface was structured around temporal order and group member identity. This was due to a pre-existing desire to understand mobile group interaction and was expected to be relevant, which it was. In the MIS studies (see Section 4.4.2), all of the field notes and pictures, and some of the audio recordings were placed in a database and used for searching and categorisation. This information was being reviewed with the intent to form requirements and design ideas for mobile tourism products. Some of the data recorded by observers did not hold a great deal of value for this purpose. However, several of the categories which emerged from post-hoc review of the data did seem to elicit requirements and design ideas. The ‘situations of consequence’ were: *questions*, *problems*, *fun*, *desire*, *intent* and *common occurrences* (see Section 4.4.2.2).

For example, a requirement relating to level of detail was originally developed from a pair of *questions* by a traveller: “Do you know what pademelons are? Is it a collective word for all types of kangaroos and wallabies?" This and other similar questions led to formulation of the following requirement (also see Appendix B.1).

> *13. Sufficient detail of travel information for the current region the backpacker is in. This will depend on the situation, goals and activities of the user. We observed backpackers asking very detailed questions about the spaces they are in.*

The social act of asking a *question* is performing an information query and implicitly expressing a problem to be solved. Thus questions (in addition to the other situations of consequence) are especially significant in determining requirements from recordings of natural conversation.

In a similar fashion, product ideas can arise during review of the same categories. For example a product idea for a 'media library' which supports various types of content that backpackers create while travelling, was developed from several observations related to problems, fun and activities. Several of the original observations leading to this product concept were:

- *"Discussing pros and cons of paying for memory cards, cheaper to use hard drive to transfer the photographs to." (problem, activity)*
- *"BP4 pulling out iPod-mini. She's showing her iPod to BP1 and BP2. She's put in one headphone. Says she'd go back to Holland if she loses it (iPod)." (fun, problem)*
- *"Transfers photographs to CD via cable at net café."(problem, activity)*

Thus, analysis of typical conversations between backpackers naturally produces requirements and products ideas. Coding the data for the above categories worked in this case and may be applicable for other types of ethnographic data. A combination of audio recordings, written observations, and the recalled memories of the situations by observers were used to categorise and understand the data. At times it was necessary to have been there to understand what participants were talking about on audio, or to interpret written observations. Many observations with design implications were immediately noted by observers in the field, which was possible because the observers were designers.

Requirements were also generated from a variety of the other studies. In particular, conversations with participants often elicited useful requirements. This tended to work best directly after they had participated in an experience similar to that which was being discussed. For example a discussion around the concept of an information kiosk directly utilised experiences from the preceding animal park visit in the discussion of the feasibility and features of the proposed device (see Page 172 for the original discussion of this excerpt).

> *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 was not very much information.

BP4: There was about the koalas.

BP5: Yeah, but we did not see very much information about the kangaroos.

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

Interviewer: So you're saying that there is 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. Cuz a lot of us have the same ideas.

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

BP5: Yeah

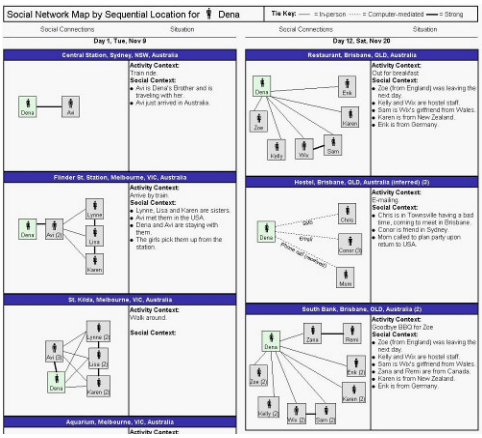
The interface idea proposed involves using a key card to identify an interest in a specific location by pushing it into a slot in a machine at the park. This is not a particularly good design concept because of the necessity to get a card for the park, carry the card, swipe various machines and see information which a static sign could have offered to begin with. However, the backpackers are extremely good at explaining what they need and what actions the device would need to perform. BP5 rejects her own idea of the card machine and proposes an alternate service that operates out of the hostel. After this concept is discussed, the conversation moves back to the topic of also needing information at the park. This leads to a discussion of credibility of information originating in different locations or from different people. All of these requirements build into the implicit generation of a design concept ‘frequently asked questions’, which is then explicitly identified and brought up for discussion by the interviewer. This excerpt only spans several minutes and yet yields a great deal of useful design information.

Ethnographic methods that couple observation with interviews provide a mixture of observed behaviour with participants' explanation of current behaviour, and speculation about future scenarios. Since they are run in natural settings, participants have immediate experiences that are easy to recall and relevant artefacts surrounding them which can be used to aid discussions. High-value contributions from participants tend to be in high-level functionality concepts or necessities for products, not in generation of specific interface designs which are outside their area of expertise.

6.5 Use of Representations and Tangible Concepts

There are two primary markets for diagrams depicting anthropological or sociological studies of community behaviour. One is researchers who wish to understand community behaviour and develop products for them. Two is the communities themselves who may wish to understand themselves better.

Direct observations of group behaviour are very rich and difficult to express to external parties. Similarly, analysis of large data sets depicting the behaviour of communities (e.g. blogging data) is also difficult to find patterns in and convey to others. In both cases there is also a need to record this information for later use. For example, it may be useful to record a history of a community, compare past and present behaviour, and possibly reflect this back to the community itself. This requires externalisation of these concepts outside the memories of those participating in observation or analysis of the community. While automated tools such as NUDIST and Leximancer provide some potential for the determination of patterns, they are often too abstract to be applied to specialised problems (e.g. the names of all people met while travelling) and patterns which they find may not be relevant for design. Additionally these tools rarely support production of summaries or results in a visual format suitable for non-technical readers. Consequently there is an opportunity to determine new ways to analyse and communicate mobile group behaviour in a visual format.



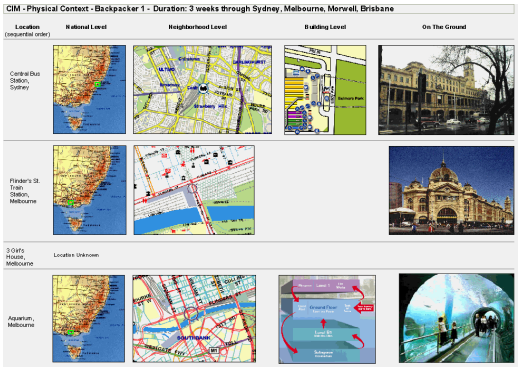
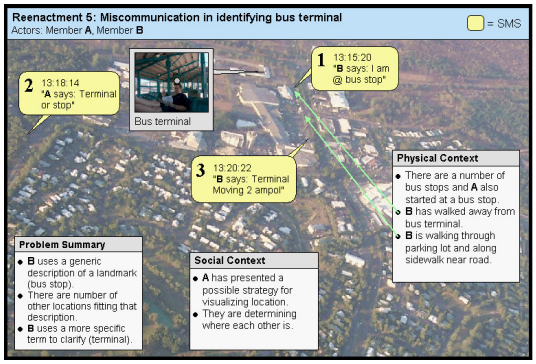


Figure 122: Social network map by sequential location. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-soc-net-by-loc.gif]

Figure 123: Physical context chart. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-physical-context.gif]

This thesis has investigated several methods of visualising individual and community behaviour. The needs of researchers have been partially addressed with a number of diagrams. Of primary interest is the ‘social network map by sequential location’ which allows designers to quickly review a period of changing social network ties, activities and context (see Figure 122). This allows designers to verify actual social situations to validate scenarios, or determine common usage environments. A similar approach is taken in the chart of physical context which shows varying levels of locational perspective during stages of travel (see Figure 123). Please refer to Section 3.8 for more explanation of these visualisations.



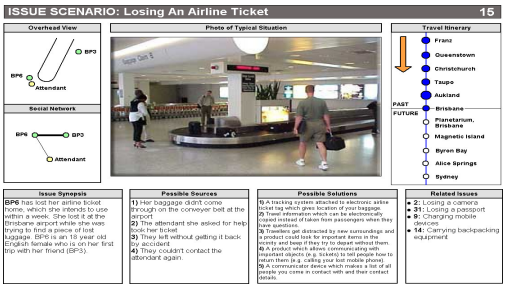
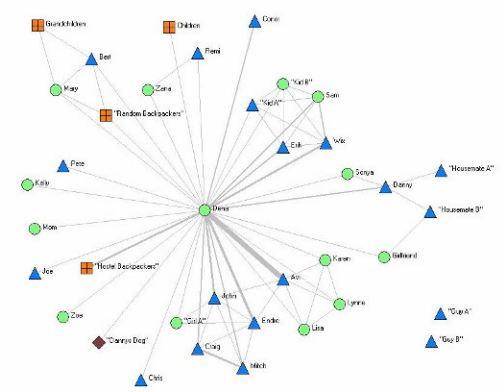


Figure 124: Reconstruction of a distributed group activity. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-4.3-reconstruction-1.gif]

Figure 125: Scenario with social, historical and physical context for a group interaction. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-4.7-scenario-1.jpg]

The structure of the 'reconstruction diagram' primarily focuses on observed situations and explains physical location of actors, underlying social and historical context and analyses situations for design problems (see Figure 124). These also have similarities with design patterns which seek to document and re-use common situations (Borchers, 2001; Martin et al., 2001). Related to this is the use of scenarios, which have similar purposes, but introduce more fictional entities (see Figure 125). Please refer to Section 4.4.1 and Section 4.7.2.2 for more explanation of these visualisations. An additional tool is web-based tables which show pictures, communications and observations about various stages of group interactions, which can be automatically generated and sorted as needed (see Section 4.4.1.2). All of these methods aim to provide researchers with visual tools to describe group behaviour in its natural setting, while avoiding loss of the critical contextual elements which were crucial to the described behaviour occurring in the first place.



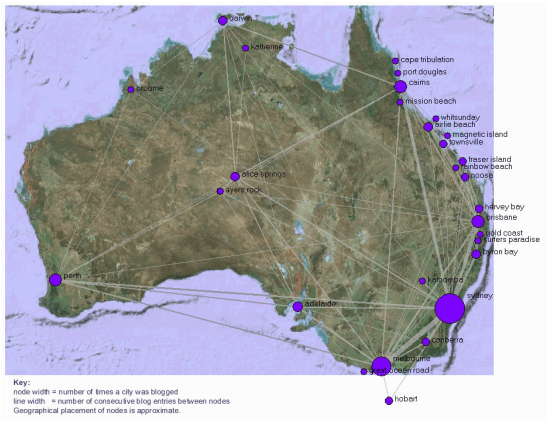


Figure 126: Social network graph showing a backpacker's social ties. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-social-net.gif]

Figure 127: Blogging behaviour around Australia. A larger version of this image is available at: share.userdesign.com/thesis/ under [ch-3.8-australia-30-cities.gif]

Other types of diagrams created here are primarily focused on enabling backpackers to understand more about their own behaviour and that of the larger community. Diagrams of social networks and the interaction between people and activities can provide backpackers with new insights into their own travel experience (see Figure 126). For example, these diagrams can assist with remembering everyone that they have met and how they are interconnected with others. On the community scale, diagrams of backpacker movement and behaviour (see Figure 127) can permit a better understanding of what a community is doing and how to adjust individual actions to relate to it. For example, backpackers wishing to avoid the crowds could stick to little-travelled routes, and might meet up with bloggers wishing to blog about locations that have not received much coverage. Please refer to Section 3.8.2 for more explanation of these visualisations.

These types of diagrams have a great deal of potential. A resident might wish to visualise the political climate of a community and understand why people are voting the way they are. Or a traveller might want to see the cultural styles or crime rates of different neighbourhoods in a new town. Similarly, geographically dispersed communities such as bloggers may want to see who is travelling near them, or which locations have been rated highest by other community members. There is currently a trend towards map-overlays, partially driven by the Google Maps API. This will be useful, but methods for mining useful data from existing databases need to be found,

and other traditional forms of visualisations such as network graphs, Venn diagrams and bar graphs may also be useful. There is also the opportunity for new dynamic visualisation methods such as those demonstrated in the Babble project (Erickson et al., 1999).

6.6 In-situ Methods

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

It is likely that some types of device interaction will be similar in-lab and in-situ. For instance, a common usability problem such as poorly labelled buttons is likely to be found in both settings. However, by working in-situ we observed many broader potential usability issues which formed part of the product requirements. For instance, interruption was a common issue for individual backpackers interacting with their natural social and physical environments. Accordingly we advise that mobile tourist assistants have interface designs that support auto-saving, undo, and default to last operation features. Essentially this is setting the requirement before it becomes a usability problem. Evaluations of user behavior in the field would occasionally discover this problem as distractions naturally arose, but evaluations of user behaviour in the lab probably would not, as it does not have an appropriate

physical and social context for distractions to arise within[33]. Thus, it is likely that some types of potential problems will only be discovered in-situ, and that it is better if these problems are discovered earlier with lower-fidelity prototypes. Whether these undiscovered problems are important enough to warrant the effort in finding them depends on the development situation.

6.7 Social Responsibility and Theoretical Choice

It is not always clear to practitioners what the theoretical aims and resulting consequences of the methods they use are. Some methods are structured not only to produce useful results, but also to advance a social agenda or produce certain kinds of technologies. The remainder of this section explores the influence that technology has on human behaviour and the influence that designers and users have on technology. Several possibilities are presented which could help developers produce more humane technologies which likewise advance humanity's potential.

6.7.1 Choosing Design Theory With Social Intent

All methods have a theoretical bias. Ethnomethodology leans towards accounts of socially constructed behaviour from the perspective of those that live it. Ethnography similarly advocates observations of natural behaviour. Participatory design has trade union and democratic leanings. Action research sometimes aims for social emancipation. Traditional software engineering can be reductionist and seeks organised structure and logical workflows. Cultural probes aim to be playful and provoke participants to reconsider their lives. Each of these theories or methods influences the participants who take part in the research, and ultimately the type of designs and ideas that result from using them. When we choose methods we necessarily promote certain social values and design processes.

Choosing a method is often a practical issue concerning what will get results or which methods are familiar and comfortable to use. However this means that we may be

[33] Heuristic evaluations conducted in artificial environments might also catch this problem, but only because user control and reversibility of actions have been previously identified as common interface problems. It is unlikely that all types of interface problems identified in-situ would be predicted by general heuristics.

supporting certain design ideologies and social outcomes of our work without realising it. So what are the implications of our design choices? What is the societal goal behind the design? Recently Google and other major US technology companies were publicly admonished for their social policies in foreign markets. *Wired* reported that US representative Tom Lantos said "Your abhorrent actions in China are a disgrace. I simply do not understand how your corporate leadership sleeps at night." and went on to discuss the need for social responsibility in the tech industry[34]. So it seems that governments are interested in the social implications of technology use, and that perhaps designers should increasingly do so as well.

6.7.2 Technology and Those That Control Its Use

In present day situations it is often difficult to easily understand complex social issues. Additionally, we often do not get to see the results of social processes which can take a century to unfold and for the results to become apparent. Thus it is perhaps useful to look at well known past examples of the introduction and development of new technologies into real communities. One such well known example was the Luddite rebellion in England in the early 19th century. An analysis of this period of history demonstrates how technologies were created, and why their introduction was received so negatively. It also provides insight into how modern-day development processes with social intent might actually be received in a similar situation.

Frank Darvall wrote a book titled ‘Popular Disturbances and Public Order in Regency England’, originally published in 1932, which forms the basis of much of the following account of the Luddites (Darvall, 1969). The Luddite rebellion occurred during the early Industrial Revolution when machinery was being introduced which changed existing work processes. Much of the English working class at this time had large families who were often living in poverty. One of the primary trades for these people was in textile production. Stockingers, croppers, hand-loom weavers, spinners, knitters and shearmen formed the primary roles within the trade. The work was hard and repetitive, and was often done for long hours in small country workshops or occasionally small factories. Professional stockingers had long constructed hosiery using a technology called a ‘stocking frame’, which was a partially mechanised tool to

[34] www.wired.com/news/politics/0,70224-0.html?tw=rss.index

perform knitting[35]. Ironically, a patent for the invention of the stocking frame in the 16th century had been repeatedly turned down by English rulers partially on the premise that it would harm the then-dominant hand-knitting trade; however, the frames eventually saw widespread usage. The frames were owned by the workers themselves; otherwise they were rented from the factory owner, which reduced the workers' pay. A number of factors including poor agricultural harvests, fluctuating overseas trade (due to war and legislation), and employers increasing frame rental rates, made for hard times for the workers. Additionally, employers were abusing established traditions by training too many apprentices at once, and inferior 'cut-up' products were being produced which eroded customer trust. Moreover, there was a high rate of inflation, and some employers paid in-kind; this meant that workers could only buy products at extravagant prices from a company store. Attempts had been made for many years by the local population to seek a legal solution to the problem, but all of these efforts to seek government assistance had failed. All of this added up to workers who were unable to feed their families, unable to get work or welfare, and who saw no signs of the situation getting better. It was in this climate of poverty, desperation and exploitation that new technologies were introduced.

Some factory owners were looking for ways to compete more effectively in a poor market by producing cheaper or more numerous products. Newer automated technologies such as steam-looms, gig-mills, dressing machines and shearing frames theoretically had the potential to reduce the number of workers that were needed. In practice, some of these technologies such as steam looms did not actually replace workers because the new technologies enabled more production while using the same number of workers (Darvall, 1969, p.57). Similarly, gig mills and shearing frames still required workers, but the work transitioned to a partially automated activity which Darvall indicates was "easier, quicker, and less painful than the hand operation." (Darvall, 1969, p.61) However, much of the working class were unemployed and desperate, and they already had a long history of disagreements with factory owners over high frame rental rates, in-kind payment, and the other abuses mentioned above. The direct visual threat of new machinery was more tangible than the remote and complex causes such as trade embargoes with the USA, the Napoleonic wars, changes in markets, inflation, and a labour surplus. Darvall indicates that it was a "…natural delusion on the part of the distressed

[35] en.wikipedia.org/wiki/Stocking_frame

weavers to think that their recent sufferings were due to this new method of production." (Darvall, 1969, p.58) However, adding technologies which further increased profits for owners was not a politically popular move, particularly at a time when workers' quality of life was threatened and unemployment was high.

From 1811 to 1817 a group which came to be known as 'Luddites' (after an early leader Ned Ludd), began attacking factories and machinery in a number of counties across England. The attacks had some localised coordination and were distributed deliberate responses to individual situations in different counties. In many cases it was the older frames which were destroyed, and sometimes a different kind of wide-frame associated with manufacturer of inferior quality products. In other districts the newer shearing-frames and other automated tools were targeted. In many cases it was hosiers and factory owners who had simply been exploiting workers who were targeted, instead of those using newer technologies. There was also a series of food riots around the same time which were related to the larger issues of inflation, lack of welfare, lack of foreign trade, and poor crops.

The English government reacted strongly to the attacks. Over the course of three years it brought in several thousand British soldiers, hired spies, imposed curfews and imprisoned Luddites. The Luddite violence did eventually encourage factory owners to make concessions which helped improve relations, and the workers began to create a union to protect and regulate the profession. However, the government continued to do little to force improvements in the industry or relieve suffering amongst the population. The use of force by the government did stop property damage by the Luddites, but did nothing to solve the underlying social plight.

Contrary to modern popular perception Luddites were not anti-technology. Many of them had been happily using the frame system (as opposed to doing it entirely by hand) for a long time, and various improvements to frame technologies had been supported by workers. Frame technology helped them work faster and still produce quality clothes. It was the introduction of another new technology which could potentially displace workers, without retraining programs or welfare in place beforehand, which understandably produced a problem. It was also the *timing* of the introduction which was an issue. Workers could not understand "the value of new machinery economizing labour at a time when goods were a glut upon the market and when there was, in any case, a surplus of labour available." (Darvall, 1969, p.62) Some of these workers may have simply wanted to maintain existing work roles and job security, but in a time of decreasing agricultural work, decreasing land availability,

changing economic climates and changing technologies, this was unlikely to be realistic.

What the Luddites did not understand (which is reasonable given the immediacy of their plight) was that markets are not static. The introduction of more efficient technologies results in an increase in the number of products produced, which means the demand of a larger market can be met. This in turn can produce more employment maintaining machinery and coping with the increased demand for products, as occurred with the steam loom. It is also often the jobs which are most dangerous, repetitive and mundane which are automated, which potentially leaves more humane and interesting work to humans. However, this process of worker retraining, unemployment and development of industries is rarely easy. As the Luddites demonstrate, without due attention from management and government it has the potential of creating inhumane and stressful situations for workers.

6.7.3 The Effect of Choosing Design Theories

The lesson to be learned from the Luddites is not that technology creation or adoption should be stopped, but that its influence on the surrounding society should be evaluated and managed in a humane fashion. The English workers needed a structure in place to defend their right to reasonable work for reasonable pay and manage retraining should it be needed. Unions have developed in many countries to support worker rights in this manner. Unions ensure that employers treat workers fairly and that exploitation is kept to reasonable levels, unlike what had happened in the English textiles trade.

Scandinavia is one such region which has a long tradition of participatory democracy which encouraged the development of strong trade unions. It is in this environment that participatory design (PD) arose (see Section 2.5.3). Consequently it has a heavy emphasis on defending worker rights, democratising design and aligning itself with the goals of unions. One of the difficulties with unions is that workers do not necessarily have an interest in allowing the introduction of more efficient technologies which require them to change job roles (e.g. the shearing frame in England). Thus, in a union-dominated environment, businesses may not reach potential efficiency levels. As a consequence of this, markets are not allowed to expand, companies may not be globally competitive, and workers continue to do mundane work which could be automated. Thus traditional PD explicitly embraces an ideological intent to give workers the power to direct and maintain technology development, potentially at the

cost of holding back society from further growth and potential. Some forms of PD attempt to address this by including multiple types of stakeholders and seek compromise solutions (Floyd et al., 1989). However, how this should occur is still a matter of debate within the PD community.

There are many technologies which we now accept as commonplace, which automated jobs previously held by humans. Hughes et. al. go so far as to say that "much of the motivation for IT is to reorganise work and, as part of this, often seek to displace labour." (Hughes, J. et al., 1994, p. 431) Examples of past automation projects include: traffic signals, ATMs, vending machines, automobile welding robots, washers and dryers, library and grocery self-checkout machines, telephone switchboards, clothing manufacture and countless other machines. Despite this trend towards increasing and successful automation, some PD researchers are intentionally avoiding automation possibilities, and instead focusing on augmentation of human workers (Messeter, Brandt, Halse, & Johansson, 2004, p. 28; Nilsson, Sokoler, Binder, & Wetcke, 2000). It should be noted that automation does not work in all situations. Notable examples include the London Underground control room (Heath, C. & Luff, 1992) and determining when to have a mobile phone ring (Brown & Randell, 2004). As these examples illustrate, some activities which humans currently do well are simply too complex to be automated using current technology. Augmentation is probably a better approach in these situations, *for the time being*. However, it should be remembered that automation projects such as autonomous aircraft and land vehicles were recently considered prohibitively complex, and are now a reality. It is probable that having these automated devices makes our lives easier, safer and more efficient. However, if a development process had been used which gave the *power to create* these new technologies to the workers who previously filled these roles - would the technologies have been created? Would an English textile worker ever have helped to create the predecessors of modern automated sewing machines and robots now seen in textile factories?

PD is not the only design theory which has social agenda. Action research is primarily a cyclical process of planning, doing, observation and reflection, but it often carries a component of social emancipation where members of affected communities research and solve their own problems with assistance from other researchers (see Section 2.5.4). This process often seeks to improve the position and quality of life of people in these communities. However, it also carries an implicit cultural bias. In the case of the Luddites, differing goals for the future of textiles would have been held by

international businessmen, the government, factory owners and workers. A development process for textile machinery necessarily would have carried with it some of the political goals of those using it.

Research methods are often designed with a particular ideological intent, which then changes as new applications are found for the methods. For example ethnography was originally designed purely to document naturally occurring behaviour over long periods of time, in reasonably stable settings. It is now being used to inform design, and in some cases to watch highly mobile users over much shorter periods of time (see Section 3.5). For design, comprehensive documentation of cultures is less important than targeted understanding of specific relevant issues. This change in application has correspondingly changed the social impact of ethnography. Before it provided descriptions of different cultures to help remote audiences reflect on their own behaviour and understand others. Now, as Hughes et. al. mention, it helps to more effectively introduce new technologies into these cultures and reorganise their daily lives (Hughes, J. et al., 1994). To summarise: research methods carry ideological intent with them, this can change as methods are used in new situations, and most design methods (explicitly or implicitly) seek to introduce change. This is as true in the age of the Luddites as it is today.

6.7.4 Social Implications of Technology Use on Backpacker Culture

As with all technologies, the tourism technologies proposed in this thesis would change the environments they are introduced into, and the behaviour of the people using them. There are elements of this which are reasonably predictable and elements which are not. For example, community authoring poses challenges for existing models of creating guidebooks. It could be that backpackers on the road will generate more current, accurate, and detailed information than professional authors had previously provided. This could easily result in the replacement of experienced paid authors with an inexperienced swarm of unpaid travel authors. It is also true that professional authors work hard and provide insightful, useful and comprehensive overviews, and that this may not be matched by amateurs. This could result in a competition between the two authorship paradigms. This scenario would be likely to result in a shift in the focus of professional authors, or perhaps the gradual elimination of this job role.

Similarly there is a small portion of the backpacker population who genuinely want to experience untainted foreign cultures, isolate themselves from home, travel without a

guidebook and use only the most basic travel equipment. Because of the increase in Internet cafes, backpackers carrying mobile phones, and the number of backpackers, it is increasingly hard for these people to find the travel experience they are looking for (Huxley, 2005). This is analogous to the increasing difficulty of finding new species on a planet that does not hold many unexplored locations. The technologies I am proposing in this research would make it easier and safer to travel, which would increase travellers' confidence in going to more remote locations (and thus increase their impact on the destinations). It would enhance the group-formation abilities of backpackers travelling alone, which could result in more group activities and more partying. The ability to e-mail, call and instant message from a mobile device carried in a pocket could result in backpackers connecting more with people at home or from a similar culture, instead of actively engaging in the cultures in which they are travelling.

So what is the aim of our technology design? Should we follow the path of the Luddites and destroy the Internet cafes and mobile phones? Should we protect the guidebook authors and instead of replacing them with community authoring technologies, seek ways to improve the quality of their reportage? Should we design technologies which help to *reduce* the ability for others to contact backpackers and guide a minority of backpackers to pristine unexplored locations? All of these options are theoretically possible, but it depends on what social aims we have, where sufficient markets are, and how much of the result we can predict. It may well be that guidebook authors will go the way of human traffic directors and telephone switchboard operators. Is this a natural evolutionary process, or is it a role which is respected in society to the degree that we wish to protect it when it is obsolete?

6.7.5 Where is Our Technology Design Leading Us?

As demonstrated in the above example of the US government seeking to influence the design of new technologies, there are decisions being made about what work roles should be replaced, who has control over the creation of new technology, and what values it will represent. The design processes we use also have a similar effect. Technological determinism is a term sometimes used to describe this technological change (Feenberg, 1999). This theory has weak and strong versions, with the latter advocating that new technologies follow their own unquestionable evolutionary path and that humanity needs to adapt to the needs of scientific progress. The more commonly advocated weak version stipulates that while new technologies do

influence behaviour, there is also another significant effect of people deciding which technologies to create and how to use them. Some social science researchers are on the other end of the spectrum and believe that personal choice and environmental situations are the primary controlling factors of technology development and use (Arnold, 2003). This perspective dismisses the history of progressive technology advancement and successful predictive formulae such as Moore's Law (Fitts & Posner, 1967) which are based on the premise that new advancements in science will result in the predictable growth of new technologies. For example, some of the most stable predictions in technology design are that devices will get smaller, more powerful and more efficient. When these powerful handheld devices are delivered into the hands of customers by hardware and software vendors, they will have an impact on employment roles, social relations and governments. People will make some decisions about how to use these devices, but they will be constrained by the physical limitations of the devices and tempted to use the features which are easy and inexpensive.

Thus it seems that there is a balance in responsibility between those who are designing and selling devices, governments which regulate their practices, and users of these technologies who decide what is desired and socially acceptable. Clearly we do not want situations where introduction of new technologies results in members of the surrounding community living in inhumane conditions. However we should also remember that the introduction of a new technology was not the significant factor in the Luddite rebellion. Instead it was unethical business owners and a government which did not enact laws to support a healthy economic climate in which people could find quality work. The older textile technology of the wooden frame was used to exploit workers, just as the new automated machinery was after it. However, some technologies do change workers job roles more than others; for example enhancements to frames were not as disruptive as entirely new shearing frames. However, it is the way that business owners choose (or are regulated) to use available technologies and treat their employees, which greatly influences the quality of life of workers. Thus it is quite possible that we as designers could use completely humane design theories, which produce a mutually satisfactory product, which is then implemented in a profit-driven fashion by industry, which results in the abuse of workers. Thus it must be remembered that design theory and methods is only a small part of the bigger picture of humane sociotechnical systems.

6.7.6 Potential Solutions: Subversive Technologies and Impact Statements

Three major factors bring an influence to bear on technology adoption: a) technology developers b) governmental legislation c) users. Developers (or designers) have more control over their own behaviour than that of the latter two. However, participatory design did have a stage where it was more concerned with political legislation than design (Helander et al., 1997, p. 303) and this is another possible avenue for designers interested in improving the quality of life of workers and users. Users themselves will ultimately choose to use technologies in a largely unpredictable and emergent fashion, so it may not always be possible to design humane environments for them. There are also other options such as boycotts or protests which seek to rally large numbers of users to change their behaviour in unison to influence manufacturers and governments. However, designers primarily will have control over the processes they use, the products that are produced, and the types of actions those products enable and encourage. There is an unofficial class of products known as 'subversive technologies', which either by design or not, have the ability to change power structures in societies. These products are often highly adaptable or offer high-level functions which are generally applicable. They often offer new forms of communication, and frequently they are inexpensive and difficult to censor and regulate. Primary examples of subversive technologies include mobile phones, e-mail, the Internet, camera phones and peer-to-peer networks. It may be that it is the actual structure of the technology which is more socially important than the design process used, or the intended use of the technology, although these are certainly related. It may be better to give users technologies which enable them to organise, analyse situations, form strategies, and represent and defend themselves than to attempt to prescribe future humane usage situations.

Another option is to predict the likely elements of technology adoption and make it public prior to the completion of technologies. This is the equivalent of an environmental impact assessment for software and hardware. An environmental impact assessment is a report completed by those proposing a new development (such as a buildings, freeways, landfills) before it occurs[36]. It uses scientific methods to predict potential levels of environmental damage or change. A part of this is

[36] en.wikipedia.org/wiki/Environmental_impact_assessment

sometimes a social impact assessment, which attempts to predict likely social consequences of the development. A related concept is an environmental impact *statement* which is used by the US federal government to discuss the likely impact on the human environment which major projects pose. This formal documentation integrates the activity of predicting the future impact of new technologies on human and environmental quality into regular development processes. Its public disclosure allows it be evaluated by communities to determine how implementation should be managed. It is surprising that software and hardware which permeates offices, homes, cafes, and clothes, and which *mediates our communications*, is being distributed without similar safeguards or public inquiry. An 'environmental and social impact statement' for technology products could become a bureaucratic step which hinders innovation, but it could also be a tool by which communities could regulate technology adoption to retain reasonable levels of quality of life. There is an interesting irony here that it may be much harder to predict the impacts of subversive technologies due to their malleability and uncontrollable nature. The development of such an impact statement is beyond the scope of this thesis and would be a good topic for future research.

These solutions could easily be applied to travel technologies. In 50 years backpacking will undoubtedly be different than it is now, and presently it is different than it was 50 years ago. At any stage it would have been possible to find backpackers who nostalgically desired a return to a previous style of travelling. Likewise, it is also possible to find backpackers who are dissatisfied with current travel problems and desire a future form of travel that is not yet available. The free market solves some of these problems by offering products which are successful if people wish to use them, and thus purchasing power is used to vote for various technologies. New mobile technologies will undoubtedly change the future of backpacking, just as e-mail, airplanes and credit cards have changed it previously. It is less an issue of resisting change, but instead managing it in a way that is socially desirable. Backpackers may find subversive open source mobile communication solutions in the future which allow them to invent an entirely new definition of what it is to be a backpacker and create a new backpacking experience. It may also be that government tourism agencies would benefit from creating their own mobile software to encourage tourism. Producing an environmental and social impact statement for this type of product would allow backpackers and locals to help shape the future of backpacking.

6.8 Summary of Discussion

This thesis discussion has focused on aspects of the selection and use of methods for studying mobility, and in particular, mobile groups. It began with a discussion of the applicability of existing mobile and CSCW methods. This section argues that many traditional methods evolved in an environment that was stable; however with an increasing interest in researching unstable mobile groups, these methods will need to be adapted. This was followed by sections offering advice on selection of methods and using multiple methods to triangulate on more accurate understandings of phenomena. These sections indicate that running pilot studies, adapting and creating new methods, and trialling methods rapidly and cheaply are wise choices. They also indicate that one method will rarely offer a holistic understanding and that multiple methods usefully offer different viewpoints on complex behaviour and requirements. The topic of requirements elicitation from ethnographic studies is introduced in the next section, which indicates that ethnographic observations contain rich requirements which can often be retrieved by looking for specific types of comments and actions in the data. In the subsequent section, the utility of visual representations of ethnographic data was discussed. Here it was indicated that many group activities and ethnographies are difficult to articulate or record and that design teams would benefit from using visual depictions of these. After this, in-situ methods were covered. This type of method has been called into question in the past, but the results from these backpacker studies demonstrate the importance of using in-situ methods for exploratory research and requirements engineering. The last section of the discussion engages the broad and ephemeral topic of the impact of design methods on social systems. This section argues that design theory and choice of methods only has a partial impact on the quality of life of users and workers. It also indicates that strategies such as producing subversive technologies and introducing environmental and social impact statements may be part of the solution for more humane design.

This chapter has also covered a number of challenges in the fields of mobile development, computer supported cooperative work (CSCW) and leisure studies, which were identified as part of the Research Question (see Section 1.1). Many of these are addressed by the project work itself; however to offer further discussion and potential solutions, several were also addressed in this chapter. These include:

- difficulties applying traditional CSCW methods to understand mobile groups,

- a lack of guidelines or guidance for how to choose, adapt and combine methods,
- a deficit in research that addresses early phases of development,
- difficulty in translating ethnographic accounts of mobile users into requirements,
- mobile research which is heavily technology focused,
- a lack of understanding of how mobile communities operate, and
- little knowledge of how tourists travel or the impact of technologies upon them.

7 Conclusion

This thesis has explored a variety of novel research methods which are suitable for understanding and designing for mobile communities. The research has focused on backpackers, who are a stimulating example of a distributed mobile community with a rich culture and challenging needs. A variety of in-situ group methods utilising both self-report mechanisms and direct observation have been used to understand the design space, develop requirements, and develop design concepts for mobile technologies. The methods and the resulting designs have been evaluated in a qualitative manner and presented to our industry partners.

This chapter offers a brief synopsis of the thesis work and makes a few concluding remarks. The first section below provides a concise review of the entire thesis and its main arguments. The section following this revisits the research question and discusses how it has been addressed by research projects in this thesis. Since our project has had input from industry, I briefly share some of their thoughts on the resulting methods and designs. This chapter concludes with a brief discussion of applicability of the results and future work.

7.1 Summary of the Thesis

The primary conclusions of this thesis are that more mobile research should be conducted via exploratory in-situ group methods, that community interaction is a major factor in mobile device design, and that the five novel methods demonstrated herein can assist in this goal. The thesis chiefly addresses the problem of finding methods for understanding mobile communities and designing mobile devices for them. The research outcomes lie in the three areas of: research methods, technology designs, and an understanding of backpacker culture, which was the application domain used for experimentation. In terms of academic disciplines, the research primarily sits in the convergence of mobile development and computer supported cooperative work. However it is heavily interdisciplinary and touches on a wide variety of other fields from sociology to software engineering.

The primary theme throughout the thesis is one of *practical methodological application for mobile groups*, including: creation, adaptation, selection, combination and usage. Other major underlying themes include: an emphasis on *requirements engineering for groups*, *visual depictions* of ethnographic accounts and community behaviour to assist design teams, and the utility of using *exploratory qualitative methods* in mobile device design. Collectively, the thesis demonstrates the application of novel methods to the emerging discipline of designing for mobile communities. It also offers detailed insight into the lives of backpackers and their requirements for future tourism technologies.

The thesis began with the introduction of the research question, and an overview of the disciplinary context, primary focus, and outcomes of the thesis. Chapter 2 is the literature review which covered a variety of relevant topics including backpacker culture, and existing technologies. Chapter 3 is the heart of the thesis and discussed the five research studies completed, including the method, results and discussion of each. It covered studies on the following topics:

- a site survey and interviews with backpackers in hostels,
- backpackers talking with each other on a tourist ‘field trip’ while using prototype mobile devices,
- an exercise simulating a social pairing system for travellers,
- sampling backpackers’ opinions via a contextual postcard, and
- analysis of travel-oriented paper and electronic diaries (blogs).

Chapter 4 is a critical part of a methodological thesis and of practical utility to practitioners. It reflects on the details of pragmatic usage of the methods: problems encountered, strengths, weaknesses and in a user-centred fashion, instructions for the reader to try the method themselves. Chapter 5 provided a summary of the conceptual designs resulting from use of the methods covered in the previous chapters.

Chapter 6 discussed some of the overarching themes and issues in the thesis. In particular it covers effective use of methods for mobile groups, development of requirements from ethnographic studies, and reiterates the importance of running exploratory mobile studies in the field. This chapter concludes with a reflective piece

on the practical social impact of using various theoretical and methodological tools in the modern design environment.

7.2 Response to Research Question and Research Contributions

The formal research question (see Section 1.1) for this thesis was:

What research methods can improve support for the conceptualisation and design of new mobile devices which support mobile communities?

This research question has been addressed in a number of ways. Existing methods have been evaluated and potential problems have been identified. New methods have been generated or adapted for use with the mobile backpacking community. These methods have been evaluated, and recommendations for their use are provided. As a by-product of using the methods, various product concepts have been generated and have undergone qualitative evaluation. The thesis results demonstrate that flexible, in-situ, and exploratory methods which focus on capturing collective opinion amongst groups and communities, show a strong potential for assisting future mobile device research.

Primary contributions of the research (also see Section 1.3) are in the areas of methods, technology designs and backpacker culture. They are as follows.

1) Methods

- **New participatory and ethnographic research and design methods** for studying mobile groups. These methods have been trialled and recommendations are made for further method development by mobile device researchers (see Chapter 3, Chapter 4). Results lend support for increased usage of studies with the following characteristics:
    - **In-situ**: Doing studies in reasonably natural environments (see Section 6.6).
    - **All-inclusive groups**: Studies which track all members of a group (see Section 2.6.5).

  - **Exploratory**: Flexible studies used early to develop ideas and early requirements (see Section 2.5.6).

- **Demonstration of why using multiple methods to triangulate** on important requirements is beneficial for mobile community research (see Section 6.3).

- **Two new taxonomies with which to understand existing mobile device research.** These help to identify 'extreme mobility' as differentiated from other forms, and different types of mobile research structure (see Section 2.5.10 and Section 2.6.5).

- **Determination of significant factors affecting structure of prototyping studies** (see Table 7).

- **Determination of key categories of observations leading to requirements.** These are 'situations of consequence' which can be categorized as questions, problems, fun, desire, intent and common occurrences (see Section 4.4.2.2).

- **Visualisation methods for portraying and analysing mobile group behaviour.** Some of these are 'reconstructions' (similar to vignettes) which recreate actual events and scenarios which are grounded in observed events (see Section 2.4.3, Figure 109, Figure 110, Figure 111). Also see other related visualisations (Figure 108 and Figure 114).

2) Technology Designs

- **New tourism product ideas**. Seven concepts have been prototyped and partially validated by users and industry players. 57 mobile tourism product ideas have also been generated, as well as the structure of a social pairing system for backpackers (see Section 4.5, and Appendix C).

- **A format for conveying product concepts** has been developed and iterated with an industry partner to assist explaining concepts to industry (see Section 5.1.1).

- **A design concept for a wearable note taking system**, which would help mobile group researchers conduct shadowing and simplify resulting data analysis (see Figure 112).

3) Backpacker Culture

- **Requirements of backpackers and other mobile communities** for mobile devices which provides insight into backpacker culture. Lists of these have been mentioned after each study and all 59 are listed together in the Appendices (see Appendix B).

- **New visualisations which show backpacker behaviour and social networks** to assist analysis and enable communities to visualise themselves (see Figure 99, Figure 102, Figure 103, and Section 3.8.2).

- **Design tensions have been identified**, which show opposing needs of backpackers that should be considered when designing for this group of users (see Figure 85).

Thus, the thesis primarily offers contributions in the area of methodological innovation and recommendations for use. This includes advice on what type of methods are appropriate, how to approach different kinds of mobility, how to find requirements in ethnographic data, and methods of visually depicting them. Additional contributions in the technology design area include new tourism technology concepts, a method for demonstrating concepts to industry, and a concept wearable system for assisting mobile group research. There have also been contributions made to our understanding of backpacker behaviour, and aspects of it relevant to design have been identified. In summary, this thesis work contributes to the growing field of mobile community design and offers practical results and advice for researchers and practitioners looking to design in this challenging environment.

7.3 Applicability of Results to Other Mobile Communities

The methods advocated in this thesis, and the results of running them, are most applicable to backpackers and other travellers. However, during generation of requirements in some studies it was noted that many of them seemed to be applicable to other types of mobile communities (see Section 2.5.10, Appendix B). This is likely to be due to the similar situations which backpackers and other types of mobile people encounter when in unfamiliar or changing environments. The backpacker community has a peculiar structure in that it is mostly made up of

strangers who are all doing similar activities, and which benefit from collaborating and exchanging information. Other communities may have different levels of trust, stability, and history between their members. Thus it could be that methods (or their resulting technologies) developed for backpackers would not fit into the existing structure of other communities. However, it may also be that there are many examples of communities of strangers that would benefit from increased connections. In any case, it seems likely that many of the core activities of members of different mobile communities are similar, and that this may mean that devices and methods could be used successfully across them.

7.4 Future work

A number of areas for future work have been identified while conducting this research. They are briefly described below.

- **Social pairing systems**: Continuing variations of the participatory social pairing system would be useful. For example, letting backpackers select their own pairings, exploring other aspects of their knowledge and expansion of the number of participants would be useful. Simple prototypes with wireless connectivity could be used after more initial requirements are determined.

- **Field trips:** The field trips used in MIS-1 and MIS-2 were iterative and began introducing simple prototypes. The next step would be taking the better ideas from MIS-2 and implementing simple functionality into them. In particular simple wireless group interaction systems would be useful to try in-situ.

- **Mobile data logging systems:** During the TIM and MIS studies I generated an idea for a wearable data logging tool (see Figure 112). Existing technologies could be used to develop this, with a budget for the necessary hardware and a programmer to develop interfaces for viewing and exporting the resulting data sets.

- **Further development of specific prototypes:** The research so far has investigated a wide variety of mobile products. Further research should narrow the scope by identifying particular product ideas and investigating more aspects of their potential usage and functionality.

- **Methodological adaptation:** The methods developed here for backpackers should be applied to other mobile communities. Different social and physical situations will undoubtedly require adaptation. It would be useful to know how applicable these methods are to other research areas and development efforts.

7.5 Epilogue

The introduction to this thesis started with a quotation from Adams' *Hitchhiker's Guide to the Galaxy* (Adams, 1979). As a scientist, Douglas Adams knew that formulating the right question and knowing what it means, is as difficult as finding the answer and understanding the implications of it. This is particularly true when building mobile devices which both are immersed in, and mediate continuously changing social and physical environments. This is one of the reasons why this thesis advocates in-situ, iterative, group studies using flexible materials. Design ideas are built to explore questions and solve problems. When these design ideas are evaluated, it is often discovered that the wrong question was being asked, or that the problem really was not really a problem. Thus it is the iterative process of refining the accuracy of questions and moving gradually from broader issues to more specific ones which contributes greatly to good design.

> *"But it was the Great Question! The Ultimate Question of Life, the Universe and Everything," howled Loonquawl.*
>
> *"Yes," said Deep Thought with the air of one who suffers fools gladly, "But what actually is it?"*
>
> *A slow stupefied silence crept over the men as they stared at the computer and then at each other.*
>
> *"Well, you know, it is just Everything … Everything …" offered Phouchg weakly.*
>
> *"Exactly!" said Deep Thought. "So once you do know what the question actually is, you'll know what the answer means."*
>
> *- Hitchhiker's Guide to the Galaxy (Adams, 1979, p. 52)*

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Appendices

A. Compilation of All Product Design Recommendations

A.1 Site Survey and Interviews

Please see Section 3.4 for a review of the site survey and interviews study. The following aspects of backpacker culture and behaviour which are relevant for design arose during the interviews and site surveys.

1. **Lack of connection between hostels.** Hostels have little motivation to connect backpackers that stay with them to backpackers staying elsewhere. They are in competition and it might result in lost sales. Backpackers often need to exchange things with other backpackers or want to meet other interesting people. There is an opportunity to connect people who are physically close but socially separated.

2. **Social divides between traveller types.** Backpackers are quite open-minded, but they have different values from other travellers. They live cheaply, which removes them from some communal activities (e.g. expensive tours). They tend to cook their own food when possible, which often keeps them in the hostel or campground. There is an opportunity of finding ways to connect travellers isolated in their small families or hostels, and possibly ways of providing cheap collaborative entertainment for them.

3. **It takes time to get to know other people and trust to form.** Many of them take the time to settle in a place for a while, which gives them more opportunities to meet people, but makes it less likely to form strong relationships with those moving faster. Travellers do not always have time to stay for long, so choosing the right place to stay for longer periods is important. There is an opportunity to help social bonding occur faster and make communication over distance more intimate, simple and cheap. Finding the type of atmosphere that an individual enjoys, and facilitating participation in a family setting could be appreciated by backpackers.

4. **They want to avoid the conversation openers of "where are you from, where are you travelling from, where are you going to, how long have you been travelling."** One of the difficulties for long term travellers is the tedium of constantly meeting new people at a surface level, and often filtering out interesting travellers from uninteresting ones. Some backpackers get good at doing this by sight, or overhearing conversations. While backpackers do enjoy their accidental meetings and discovering improbable similarities, they might enjoy a technology which made it easier to find people of a certain type. There is a large portion of the social network surrounding a backpacker which is hidden. Making this more tangible could be used either to find something familiar and comforting or something distinctly new and different depending on the needs of the individual.

5. **Ad-hoc group formation based on particulars of the situation.** There are many different variables which affect how backpacking groups form. While no situation is the same there are likely to be patterns which typically occur. Based on these interviews some of these factors appear to be: time of departure, size of group, availability of transport, goals of group members, and motivation levels. Many of the groups are very short term (e.g. a day tour group) and disperse shortly after the activity is done. Backpackers often try to retain contact with group members via e-mail group discussions, SMS or hoping to run into people in public locations. There are very few tools available to backpackers currently to facilitate group decision making, communicating within groups and extending the lifetime of a group following a short activity.

6. **Use of "stopovers" and home bases which provide stable places in between movement.** Many backpackers 'pause' in certain locations to relax, recuperate, see the sights and meet people. Many activities happen in these shared, static environments. While Internet cafes have impacted this space, they are still largely used for e-mail. Group activities within a hostel are not facilitated by modern technologies. There is an opportunity for public or personal technologies which help groups coordinate and individuals to connect.

7. **Small world networks with few numbers of ties separating people.** Stories of happenstance meetings with similar people are very common. These stories are particularly intriguing when backpackers tell them. This is

because the geographical distances are greater and the situations are typically more exciting. Small-world networks exist all over the planet, and backpackers are no exception. This means that there are typically very few links between one backpacker and another. However these ties are often never discovered, or take long periods of time to discover. Technologies could assist in helping people find their similarities.

8. **"Asking for the information you want". It takes time to find the right person with the right information.** Gossip and chatting exist in part to help people find what they need. Hostels use low-tech technologies such as bulletin boards and word of mouth to find what they need. As travelling is often time-critical, many opportunities for coordination and sharing are lost. There is an opportunity to provide a sharing network that connects people rapidly and more efficiently.

9. **Control of information and contactability.** Many backpackers enjoy being anonymous, having control over their identity, being playful with information, and controlling who can contact them. Personal or public displays need to be very cautious to conform to existing social norms around these practices. Backpackers tend to have moderate levels of skill with new technologies. Any communication products they use will have to be highly usable for them to be effective.

10. **Desire to communicate with groups on a short term basis and control access to groups.** Ad-hoc groups do not always have a long formation period. Groups could use ways to rapidly form group communication networks and then break them down after they no longer have use. It would be better if these networks formed automatically, worked in remote areas, and retained possibilities for continued use later, which would retain bridge connections between new and old social networks.

11. **Reliability of gossip.** It is hard for backpacker to confirm the quality of information they get. They get good at making fast character judgements and they often try to get multiple opinions before coming to a conclusion. Finding several people (getting a large enough sample size) who have the information desired, is useful to evaluate individual claims, but is often difficult to obtain in many situations. There is an opportunity to build a system for people to automatically share tips about places they have been. When a backpacker

needs to make a decision they can see the opinions of a large number of people rapidly.

12. **Problems with guidebooks.** Guidebooks have many problems. They are usually between 1 to 3 years out of date. They have the opinions of a few professional travellers who often have more money than the average backpacker. They are in large heavy books and the maps are not large enough or detailed enough. However, guidebooks do work fairly well, and are used by nearly everyone, but there are many opportunities to improve on the paper guidebook.

13. **Finding places in unfamiliar areas.** Backpackers constantly have a need for timely, local information. They do not just need maps, but many diverse layers of information describing the regions they are in. There is an opportunity to help wayfinding and understanding of new places for backpackers.

A.2 MIS-1

Please see Section 3.5 for a review of the MIS-1 study. Based on observations and discussions with backpackers there are a number of design issues which are related to extreme mobility that have become apparent.

1. **Long term travel and intermittent pauses.** Backpackers often experience the extreme end of mobility, which for them, happens over long periods. Rates of travel change, but are often frequent and cover large distances. This will be likely to change depending on the type of mobile user. No one travels continuously, and the characteristics of pausing behaviour will be informative for mobile device design. Devices may need to support different activities when users are temporarily in static or low-mobility modes of travel. Communication networks may need to adapt to, or take advantage of, slower hubs in the movement of the travel network.

2. **Design to be carried on the person or ubiquitous in common environments.** Backpackers carry large packs with gear that they do not use frequently, or which they can leave at the temporary “home base” of a hostel. Most devices that are commonly used need to fit into a small backpack. This is carried with the traveller on day trips, or worn on their person. Extremely mobile people will be a prime market for wearable computers that provide rapid access to needed travel information used for decision-making.

3. **Ad-hoc structures are already present.** Social networks among backpackers and other mobile groups change rapidly. Social networks change as people physically move away from each other. Travel networks form and dissipate as people temporarily form groups and then move off by themselves or in pairs.

4. **Memetics is a theory introduced by Charles Dawkins**, and which been highly controversial ever since (Dawkins, 1976). Briefly, the theory of Memetics argues that a hypothetical construct called a meme is a chunk of information or an idea which mutates a small amount in each replication of itself (Blackmore, 1998). Similarly to genes, some memes may propagate further than others or die out. Memetics researchers currently have little scientific proof for memes (Polichak, 1998), but it provides a useful lens through which to view backpackers. Instead of focusing on backpackers, we can look at where their memes are going. Memes of travel information flow between travellers, primarily when people do joint activities such as tours, or meet in social locations such as pubs. These networks of movement, bodies, money, social ties and information form the environment in which mobile devices are introduced. These devices may be able to use existing structures to work effectively.

5. **Reducing reliance on local sources enhances personal freedom.** Extremely mobile people need to gather whatever information they can, often at the location near where activities will take place. They necessarily need to evaluate biased and limited information to make decisions about further movement. Local information can be good, but having a supportive community of informants available to provide a second opinion allows better decisions to be made by the individual.

6. **Reducing the cost of travel encourages mobility.** Not all extremely mobile people will be travelling on small amounts of money, such as many backpackers do. However, lowering the cost of stages of travel, or generating a cost-based topography of a travel region could be useful. This would allow travellers to do more while they are in an area. Increased confidence about expenditures could also encourage longer stays.

7. **Using Ethnography to Determine Problems and Enjoyment.** An ongoing debate in the HCI community considers the practical application of

ethnographic methods to design (Hughes, J. A. et al., 1997; Squires & Byrne, 2002). As researchers experienced in both ethnography and design, we see a highly compatible relationship between: rapid, partially naturalistic ethnographic methods, product conceptualisation and preliminary concept evaluation.

A.3 Contextual Postcards

Please see Section 3.7 for a review of the contextual postcard study. The following design recommendations and requirements for tourism technologies result from the answers backpackers provided, and reasonable assumptions that can be made from them.

1. **Backpackers often want to contact others for emotional reasons.** It can be for assistance, to cure loneliness, or to make others worry less. Being able to quickly contact others and convey emotion clearly is useful.

2. **Many of the backpackers did not respond in good English.** Device designs should support multiple languages, cross-cultural conventions and translation capabilities.

3. **Backpackers have serious concerns** that greatly affect their lives while travelling, such as finding accommodation, finding good tours, or getting taxes refunded. They would benefit from a better medium for sharing tips with each other which avoid the bias of those profiting from running services in these areas.

4. **Backpackers are using a range of communication technologies.** E-mail is often used because it is relatively fast and cheap. However, other technologies could be successful if they are cheap, fast (where mobility is a factor) and effective for what backpackers want to convey.

5. **The participants wanted to know about the environments they were in** and had many unanswered questions. While there are certainly information sources available, there is clearly room for improvement in getting information to those who need it.

6. **Location-based virtual graffiti may suffer** from a similar social phenomenon commonly experienced on bathroom walls; the content may be

high-level, cliché, or crude. The location and mental state users are in when they leave the message are likely causes. It may also be the anonymity and lack of clear audience which produces this. There is scope for more research in this area, but it may be helpful to couch location-based services in the context of other activities which have their own social norms to self-regulate the type of content.

7. **Support collectively owned discussion media.** Backpackers will need to discuss topics that are not politically correct without censorship from official bodies.

A.4 Electronic and Paper Travel Diaries

Please see Section 3.8 for a review of the diary studies. Analysis of the photographs, textual blog entries, resulting network graphs and other depictions allow insight into backpacker behaviour and requirements. Many of these have direct implications for the design of mobile travel assistants which are briefly discussed below.

1. **The needs of the audience.** In the case of recording technologies, insufficient emphasis has been placed on the audience viewing the media as opposed to the direct user of the device recording the media. Knowledge about the intended audience and output formats greatly impacts how backpackers choose to record their experiences. The ability to censor certain photographs, easier access to online publication systems and methods of recording more or depicting context more effectively would be useful.

2. **Challenging situations.** Blog photographs with people in them have a high incidence of standing (60%). Regardless of whether this indicates prolonged standing, or pauses in walking or running, it shows the frequent lack of a stable environment. If backpackers are frequently standing, it may be difficult to find places to rest portable electronics. Likewise, balance needs to be maintained while using devices and the surrounding environment is likely to be more distracting. This increases the chance of dropping devices, and needing one-handed or non-visual interfaces. Wrist lanyards, waterproofing, speech feedback and better text input devices for extended diary entries are reasonable design goals.

3. **Social devices.** Backpackers frequently meet others and often engage in group activities. Currently many of these activities are arranged for profit by tourism operators. Backpackers often lack the communication tools to facilitate forming their own group activities, meeting like-minded people or dating. Providing social networking tools that are built to work under ad-hoc, mobile and isolated circumstances would be useful.

4. **Usability of recording and sharing.** Currently it is quite difficult to record travel. It requires a reasonably expensive camera that is constantly at risk of being damaged or stolen. It must be carried around in a small bag and worrying about batteries or charging. It only records a subset of what is actually experienced. Storing large amounts of photographs is a problem. Transferring those photographs to a safe location is difficult and stressful for those worried about losing their memories. Explaining what photographs or videos mean (via tagging) is not supported on most cameras and very time-consuming to do via internet cafes. Uploading large amounts of photographs is also difficult and expensive. There are numerous possible solutions to these issues, but the problems need to identified before solutions become apparent.

5. **Support sharing of extended experiences.** Backpackers travel for long periods. They do not capture a few hundred pictures of Rome and then go home to show them to friends. They capture thousands of photographs of multiple continents and potentially hundreds of locations. Tools to navigate these large data sets, summarisation tools, and interactive methods for moving between overviews and details of interest are needed.

B. Compilation of All Product and User Requirements

B.1 MIS-1

1. **Being cheap, at least for the core market.** This includes all aspects of operating or using the device or service for standard functionality. A common theme throughout the field trip and workshops was money. Even backpackers travelling with larger budgets regularly asked questions about how much things were and attempted to determine where to get a good deal. Nearly every proposed feature will be impacted by its cost. Cheaper solutions may succeed over better, but more expensive solutions. Information queries on most topics could include pricing and comparison links. Allowing backpackers cheaper options and more control over evaluating costs is likely to empower backpackers.

2. **Withstanding harsh/extended usage.** Rain, the possibility of dropping in water, dropping on the ground, and complaints about potential for scratching were observed. Backpacks carry items for long periods and often rely on them to work on a daily basis. Getting repairs done is often not an option.

3. **Access to service by basic phones, at least for critical functions.** Possibly with a degraded experience for more basic models. Many backpackers will be using basic mobile phones. Sometimes they purposely carry older models because of the possibility of theft. Supporting both high and low end devices will be a necessity for the near future, while supporting new phones which will eventually become dominant.

4. **Both mobile and static devices.** Internet cafes are widely used and some travellers will probably prefer the better user-experience of large screen displays. They may use services while surfing the web for instance. Others will need to book from remote locations or from situations where they can not or do not want to access a desktop.

5. **Long-lasting secure power supply.** Longer battery life could be supported, or safer charging methods such as using a separate charger and extra battery. This extends battery life and does not risk the device while charging.

6. **Flexible planning.** Some travellers will want to plan and others will not, and some will use it only it only in certain cases. Supporting varying levels of planning for different types of users. Advice on when it is necessary to plan might be useful.

7. **Encourage inexpensive activities as a consequence of the design.** For example, steer them towards swimming not scuba diving. Backpackers in our study complained about, or were concerned by, the cost of travel. Defaulting to cheaper recommendations would perhaps result in fewer complaints.

8. **Coexist well with other surrounding backpacker technology it will be used with.** Backpackers use a lot of other gear and some of it is carried in small backpacks or on their person. If a device does not fit well it will be left back at the hostel, or at home.

9. **Rapid updating of travel information.** The travel environment changes and an information source or medium to document it needs to change with it.

10. **Adding personal comments to travel information presented in the interface.** We talked to backpackers who wrote comments about places in their guidebooks, and others who recorded accounts of where they went. Allowing free mark-up, and probably exchange of these notes with others is a natural extension of normal travelling behaviour.

11. **Accurate information and methods to ensure its continued accuracy.** Trust in a product declines when the information is incorrect. Accuracy is not only about frequency of updating; it is also about reliability of the authors and methods of making sure changes are used by others.

12. **Avoid individual author bias, or make it explicit, and provide other viewpoints.** The best path to truth is from multiple perspectives. Allow backpackers to see multiple perspectives, find those they agree with and give them methods of evaluating their worth and accuracy.

13. **Sufficient detail of travel information for the current region the backpacker is in.** This will depend on the situation, goals and activities of the user. We observed backpackers asking very detailed questions about the spaces they are in.

14. **Practical activities in the current environment.** Backpackers need to do practical things in unfamiliar environments. These include finding bathrooms, food, water, transportation and many other things. They often have to ask questions about this and frequently miss available options (e.g. a public bathroom that is close by.)

15. **Finding other sources of information.** Information centres or other people (locals or travellers) are often good sources of localized information. Finding good quality information resources is sometimes difficult. We observed backpackers asking where tourist information centres were and asking the wrong people for information they needed at times.

16. **Different levels of travel-cost, without inconveniencing individual cost groups. Some people travel with more money than others.** Guidebooks might allocate a portion of the book to higher priced items, which would never be used by some travellers. This inconveniences the other travellers with more weight and extra navigation and less advice in the areas they want. Finding ways around this is necessary[37].

17. **If maps are provided, support finding the current location (and possibly orientation) on it.** We observed several backpackers who were confused about where they were, and even experienced map users still regularly tried to find their location. It is a basic and heavily used function.

18. **Using while moving, with interruptions and in distracting environments.** Backpackers in this study used most of their devices amongst other people, were interrupted by others, multitasked conversations and walked in very busy situations. Designing for the worst-case scenario means it will be highly usable for the more common and less extreme situations.

19. **Usage at night, in direct sunlight and in highly noisy environments.** We observed users using devices in dark rooms in the animal park, in bright sunlight and areas with traffic or loud talking. This will affect types of screens, backlights, use of audio output and other interaction methods.

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[37] Some guidebook companies offer shorter volumes for budget travellers. However, travellers sometimes change expenditure plans while on the road, and many backpackers may not want to miss out on potentially useful information to get a volume that is only slightly thinner.

20. **Usage in environments where the primary user is also holding simultaneous verbal conversations with others.** Particularly younger backpackers are being observed listening to music players, chatting via SMS, looking at photographs on cameras and talking all at the same time. Expect the user to not give you their full attention.

21. **Encourage useful exchanges of desired information within user groups.** Particularly, exchanges where one has information another needs soon. It is best in cases where each has desired information, which supports reciprocity. It is also useful where both partners are likely to stay in the same place for a while and social capital can build from unequal information exchanges.

22. **Sharing of physical goods and resources between backpackers.** We observed backpackers exchanging items frequently and giving gifts to each other. Exchange of resources assists strengthening of social ties and helps backpackers form support networks.

23. **Interaction with primary owner when he/she is not holding it**, or when it is being shared with others. We witnessed technology being exchanged by backpackers. Recent mobile phone research has shown extensive sharing of devices. The design should accommodate this possibly by maintaining communication with the original owner.

24. **"Showing off" the product to others.** Technologies are used to attract others or advertise personal attributes. Guidebooks are used in this way and we say mobile phones, iPods and cameras used in this manner. Some designs facilitate this more than others.

25. **"Fiddling" with the interface.** Small playful movements for no purpose. We witnessed backpackers frequently playing with small items in their hands or bags, often while sitting. Devices that support this will be more visible and talked about and probably have better adoption rates because of it.

26. **Local and remote sharing of information resources (gift giving) obtained from usage.** Backpackers were observed offering to mail each other photographs. We also observed sharing of photographs directly via cameras. Supporting sharing while together and apart is important.

27. **Maintenance or usage of the device by multiple users.** The device will eventually be used by others, even if it is designed for one. Supporting hiding private information from new users or supporting different user needs may be relevant.

28. **Maintain a friendly and relaxed dialogue with the backpacker.** They already have this and want it supported and reciprocated.

29. **Finding memorable travel moments.** These are by definition subjective and backpackers should define and rate their own. We observed backpackers sharing these moment quite freely amongst other backpackers.

30. **Spontaneity.** Backpackers are willing to do things on short notice. Give them the option with timely information.

31. **Advertising backpacker status to other backpackers** (or finding other backpackers). Backpackers tend to be social and like meeting people with information they need. Some expressed a desire to meet up with others for various types of activities.

32. **Complaining and critical review.** Backpackers need to be able to rate and comment on everything. We observed them doing this naturally, but it has yet to be networked.

33. **Different languages.** This applies both for the backpacker and for interpreting the environment. Many backpackers speak English as a second or third language. Word definitions, translations of signs in the environment or announcements and some topics of conversation were issues for backpackers we observed.

34. **Finding the "cheapest available option".** In addition to supporting travellers with different budgets, simply supporting the bottom line is useful. Knowing what the cheapest option is allows all travellers to choose where they want to be on the quality scale.

35. **Plan for the device/service to be lost/stolen.** We talked to backpackers who had lost items. To minimise impact of this, design for the case of it happening and reduce the damage to the user.

36. **The central network going down or is unavailable.** Networks will not always be available. Remote locations are common. Backpackers may not always want to use official networks. This indicates the need to support local, peer to peer, ad-hoc and cost-efficient networks as alternatives to other methods.

37. **Low weight and small size.** Backpackers carry a lot and prioritize lighter and smaller items. Size is more critical depending on where it is carried (e.g. pocket, bag, or wrist).

38. **Provide entertainment in times of boredom.** Backpackers regularly have boring periods during travel situations. Fun group activities would be appropriate.

39. **Helping backpackers to communicate easier.** Phone cards, SMS, voice calls on mobile phones, email and in person discussion were used by backpackers to contact home, family and friends. All of these methods have usability problems and providing more efficient or enjoyable solutions is needed.

40. **Different types of travellers travel differently:** support each group defined in the user profiles. Different designs may be necessary for different user groups. Not all backpackers are the same.

41. **Short stays and long stays.** Backpackers often settle in a few locations briefly. Needs change during longer stays and social networks frequently grow larger and stronger. Support the backpacker with information fitting both situations.

42. **Desired positions on the Design Spectrums.** Different user groups may have different needs and consequently different locations will be appropriate on the Design Spectrums for them (see Section **3.5.3.2**). Incorporate this into design ideas.

43. **If the product stores media, it should be large enough to accommodate media collected over a trip of at least six months**, or have other provisions for removing media in a safe manner. The participants in this study had travelled for over a month and were travelling longer. Some backpackers travel up to several years. Many backpackers record their travels in some way

and providing sufficient storage for longer periods of time should be supported.

44. **If group device: Sharing of strategies for locations.** There are often ways to get the most out of a situation, but you only learn it after being there. Methods of sharing these strategies would be useful for the community.

45. **If group device: Support splitting and joining of groups.** Backpackers frequently split and rejoin. This means some collaboration will occur remotely and some collocated. We have observed this happening on both the short term (several hours) and long term (weeks or months). Support different communication methods for these scenarios.

46. **If group device: Support natural relationship building stages** in groups (if community device, support same). Groups have stages of development. Certain types of activities will be inappropriate at certain stages.

47. **If community based, let backpackers share ideas about how to have fun.** Some are good at finding unexpected ways to enjoy themselves. A method of sharing these ideas would be likely to increase quality of the travel experience for larger groups.

48. **If mobile device, be compatible with carrying in small backpack, pants pockets, or other clothing.** Handheld devices need to fit in pockets with other typical objects. They need to be aesthetically pleasing. How the device is used is dependent on how other devices are used.

B.2 MIS-2

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 often 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 do not always want official information and they do not 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 one another end up meeting each other. MIS-2 clearly shows cases of backpackers who did not 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.

B.3 Social Pairing Exercise

The following requirements resulted from data analysis and experiences running the studies. It is likely that some of the requirements are peculiar to the needs of backpackers and may not be able to be generalised. However, it is likely that some requirements relate to common social norms and universal physical limitations which may be applicable in other situations. They have been developed from a small sample, but have been replicated, and thus, are believed to represent typical backpackers.

- **Use pairings to help people achieve something.** People are using the system for specific purposes. Theoretically accurate ties are not as important as those rated highly by those using the system.

- **Support reciprocal [Past⇨Future] pairings** where possible.

- **Do not overload hubs.** Some people will naturally have more useful information than others due to travel routes and duration of travel. Hubs will not be able to support all feasible ties to them unless automation is used.

- **People may enjoy reliving mutual past travel experiences** [Past⇦⇨Past]. Support users finding others whom they have shared past experiences with.

- **Experienced travellers necessarily have more and better quality information to distribute.** Social capital and reputation are currently gained for very short periods (a few days or less). Support methods of establishing lasting reputation between strangers so that appreciation expressed by one backpacker is not lost on others.

- **[Future⇦⇨Future] pairings are not as useful** to support unless users specifically desire to meet in the future.

- **Include personality and behavioural traits in determining pairings.** Informational affinities may not be rated as high by participants if they come from a person who does not value similar things or travel similarly.

- **Expect short relationships most of the time.** Returned postcards showed that few backpackers maintained contact with group members outside of their travelling groups for long.

C. Table of Product Ideas

C.1 MIS-1

Feature	Description	Applications / Requirements / Comments	Source Data / Justifications
1. Locate / Find	Locate resources	• Restaurants • Toilets • Water • Products (e.g. Pants) • Cheap stuff • Show me…	• Wants to find jeans long enough. Discussing what brand to find jeans that fit. • They were talking about ATMs and where to find them • Trying to find restaurant. Confused over buffet seating for tourists. • Checking water tap on hut [possibly wanting drinking water].
2. Read Other Comments	See what backpackers have been saying about a location	• Restaurants • Specific food items	• She did not like food quality. • Discuss where to eat roo and other types of Australian restaurants.
3. Currency Conversion	Take a price and convert it to another currency	• Between home and current country • Needs to be rapid (used in conversation and while shopping) • Possibly scanned direct from price tags	• Discussion of currency worth and rates between English/US/Australian/Dutch. • She is getting very confused about exchange rates. • History of Euro.
4. Maps	See a birds-eye (extrinsic) view of the location	• Of current and distant locations • Show function of current location • Path to get there from here	• BP5 reviewing map & schedule. • They turned around as it apparently did not go where they wanted. They are walking back the way they came. Example of map not working. They are walking through another section of the park. They have stopped to look at the map. Then pointed in direction they wanted and then walked that way. • She sees there is a car park on the map and asks if there is access by a bridge. • Wants supermarkets on maps.

5. Announcements	Read official announcements for location	• Request repeat last broadcast • Query location and next stop • Current or remote (e.g. Restaurant)	• They are looking at photo offer signs. • They are looking at sign on window. • Could not understand airplane announcements very often.
6. Translation	Translate content our output from any other service into native language.	• Even partially accurate translations may help. • Multi-lingual content	• Could not understand airplane announcements very often. • Asking about English tenses of drank.
7. Activities List	List of potential things that can be done in the immediate area	• Cost comparison • Descriptions • Distance • Associated transport requirements • Activities, parties • By broader region or current section of town	• Cost of trips ($150 is high). • Bus cost me 30, he took train. Times leaving and routes. Places they want to go (Melbourne). How to get to location (flights). Discussing what Is cheaper. How long to travel to Byron (10 days) • Discussing cost of travel. How much spent in different areas for time periods. • She is got the discount card for boost, (10 get one free).
8. Personal Object Detection	Determine if valuable items have been left behind.	• Beep if not in bluetooth range • Keys, passport, credit cards, etc.	• Found bag. She took off with tickets. They left without the tickets. “loads of people loose their tickets”. • Lost passport. Someone found it for her. She was drunk. Passport is only id
9. Find Travel Options	List of methods of getting to another location	• Discount fares • Ridesharing	• Share car resources, ride-sharing. • Want to be able to meet up with old friends travelling, or with strangers (e.g. Ridesharing).

10. Cheap Communication	Methods of communicating that do not cost much or are free.	• Voice over IP? • Instant message • SMS • Bluetooth chat? • New technologies	• Sending SMS to friend. • She gets people to call her. • BP4 is on the phone with someone.
11. Media Library	Method of storing various types of content and communications backpackers create.	• Import photographs from memory cards • Upload to ? • Mp3 storage • Streaming[38] • Easy local and distant transfer • Display in big screen	• Pros and cons of paying for memory cards, cheaper to use hard drive to transfer the photographs to. • BP4 pulling out iPod-mini. She is showing her iPod to BP1 and BP2. She is put in one headphone. Says she'd go back to Holland if she loses it (iPod). • Transfers photographs to CD via cable at net café.
12. Group Initiation	Ways of collecting people for common causes.	• "I will do this if other people will."[39] • Group trips • Anonymous option • Find groups doing…	• Want to be able to meet up with old friends travelling, or with strangers (e.g. Ridesharing). • Changing plans, meet people, not knowing where people are. • Meet up with guy they met in NZ in Brisbane.
13. People Tracker	Methods of seeing where others are.	• ID cards of people have met • Sortable by chronology • Visualizing immediate group you are with • Rapid auto-configuration based on people currently in contact with	• Meeting but not recognising people. • Meeting in Paris for birthday. • "Where is everybody?"
14. Financial Planner	Methods of tracking and projecting trip expenses	• Track expenses • Predict future expenses based on past behaviour • Get estimates of trip costs from others who have done it	• Asking about shipping costs. • Discussing cost of travel. • Asking about how much the trip costs. • How long and what did for given amount of money. Financial planning. • Spent 2000 pounds in NZ.

[38] http://www.smartmobs.com/archive/2005/06/17/dittybot_sms_t.html

[39] http://www.pledgebank.com/

15. Security Options	Ways of securing private and valuable data stored on devices.	• Auto-lock device • Rapid unlock • Remote disable • Net backpack	• Lost tickets. • BP3 is talking about being really drunk and dropping passport . • Stuck in room, iPod, passport, telephone, tickets, she leaves in room.
16. Gossip Column	Support uncensored and individual forums for discussing opinions on people and places.	• Positive and negative feedback about people and places • Searchable • Integrated into information lists in other areas.	• Recommendation system, believability of information. • "Never been to an information centre. I just ask other backpacker for information. Because…. Other backpackers know the best spots. They really do." • Talking about Milford sound. BP3 says bad weather. Says they could not see anything. They did not like it. Says difficult to get there.
17. Topic Lookup Or "What Is This?"	Get information on current item in environment.	• Find an expert (online or local) • Via camera phone photograph • Wikipedia / Google tie-in • Via tags in environment	• BP4 talking about seeing a wallaby. BP5 asking about seeing dolphins. • BP1 asking about people getting bitten by sharks. • Talking to zookeeper about how old the koalas are.
18. Discussion Forum	Support more general conversations about more abstract travel topics.	• Threading • Mobile accessible • Probably also web accessible • Input problems	• Discussion of what it is to be a backpacker. • Wants to throw away sleeping bag because heavy. BP3 only used sleeping bag once. Planning to go south and will need sleeping bag. • Talking about how much money they took travelling. Other girl worked jobs to have money before travelling. BP4 worked for 5 months, made 3,500 euros to spend here.
19. Travel Blogs	Support recording journeys and sharing them with interested parties.	• Support keyword tagging[40] • Pictures of locations • Drawings and maps authored by travellers	• She is taking picture for him of him feeding roo. • BP5 wants to look at pictures on BP4's camera. • She is going to give BP1 her website, where she posts her picture.

[40] http://www.flickr.com

20. Calendar	Situationally relevant calendar support.	• Local holidays in current location • Travel consequences based on local events • Travel planning support	• Closure of supermarket for holiday. • Discussing time of Easter and holidays. • They know each other from room. Confirmed date. Planning evening, rooftop bar. • She planning on doing Whitsundays sailing trip.
21. Exchange + Gifts	Support easy swapping of items and gift-giving.	• Rides • Objects • Houses / rooms • Books • Clothes • Food	• Just shared a photo. • Exchanging ID or wallet thing from BP4 to BP5. • BP2 gave her sunglasses to BP4.
22. Complaint + Feedback	Support giving feedback to those at current location.	• Must be rapid and actually be read. • Support both anonymous and identity based • Focused on current location for contextual feedback	• BP4 talking about being in same room. Same problem with trash container and noise. Discussing where their rooms are in relation to each other. • Eating, Bad food, Discussed trip being too expensive.
23. Uncensored + Decentralised Communicati on	Backpackers already are able to talk freely in small groups and choose to identify themselves or not. Enhance it.	• Encryption • Anonymity in some cases • P2p • Short range communication • Rapid support of collocated groups	• Discussing bungee jumping in Queenstown. Did bungee jumping 3 times. Enjoyed nude bungee. • Issues of running out of money, Nude pictures, $1500, Discussing ways of making money, Advertisements everywhere'.
24. Event Notification	Allow backpackers to choose to be notified of relevant location or activity relevant events.	• Table ready • Laundry ready • Cheap tickets available	• She is going to do laundry tomorrow. • Waiting for koala pics. • Waiting to be able to take pics. • Waiting in line for park. • Waiting in line to get on boat
25. Electronic Wallet	Reduce the number of items backpackers have to carry and risk of loss of ID or money.	• Door opener for hostels • Money? • ID card / passport • Profile • Payments • Medical history	• Passport is only ID. • How to keep passport safe tips. • Still talking about how much money they spent while travelling.

26. Compare Offerings	Easily compare different things to see which is cheapest, best, furthest, etc.	• Products • Hostels • Travel activities • Jobs • Compare to cost at home for similar item	• Experimenter introduce topic of city cat. Discussing how it compares to other travel methods (taxi, bus). • Bus cost me 30, he took train which cost him less. • Says she went to hostel in guidebook that was out of business.
27. Determine Cost Of	See how much things are.	• Activity • Trip • Food • Products • Tie in with backpacker diaries • Factor in goals, routes and time scales	• Cost of trips (150 is high). • Cost of pics. • Asking about shipping costs. • Discussing beer and film costs. • "Twenty bucks! Wow, that is a lot of money."
28. Social Behaviour Indicator	See how it is acceptable to act in a location.	• Purposes of locations • Norms • Acceptable behaviour as discovered by other backpackers	• Trying to find restaurant. Confused over buffet seating for tourists. • Kevin was unsure about location of shops before
29. Work Finder	Find available employment in current area and present time.	• Other workers evaluation of the job • Pay comparisons	• Joking about having a job for BP6. Half serious, hand out leaflets, 8 bucks an hour • Had two jobs before • Discussing going home early. Issues of running out of $. Exchanging job offers. Get $ to continue travel. "Make lots of money, stay forever". Nude pics jobs in Sydney • Talking about the need to get a job. "money is such a big problem"
30. Danger Awareness	List of dangerous aspects or regions in the current location.	• Map of high crime areas • Warnings from other travellers • Warnings from locals	• Using map to determine where not to go

31. Determine Location Of…	Find where something is, or the nearest something.	• Toilets • Grocery stores • Post offices • ATMs • Food • Water tap	• Asking about post office, whether we pass by it on way • She went to buy water and bathroom • Breakfast, pizza (delivery) food advice • They were talking about ATMs and where to find them. “Hope we come across an ATM.”
32. Availability Visualisations	Ability to see open resources in public settings.	• Open seats on a boat • Exhibits with few people	• Finding chairs on deck • They were standing in line, no discussion • Waiting in line at koala centre
33. ”I Wanna Do Something Now!”	Instantly accessible activities supporting spontaneity.	• Low cost or free • Group activities • Nearby or easily accessible options	• Going to music festival in Byron next day. • Karaoke, free drinks. As a girl getting free drinks easier • Free museum times • She did some decorating in the Downunder bar and got free drinks
34. Backpacker Products	Low weight and small size products. And possibly cheap workaround solutions.	• Way of finding store • Support backpackers trading these items	• Planning to go south and will need sleeping bag • Planning to go south and will need sleeping bag • He takes off backpack to put raingear down inside it

C.2 MIS-2

Feature	Description	Applications / Requirements / Comments	Source Data / Justifications
35. 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 yoghurt store, they really like the yoghurt • Device to label location • They finished the koala photographs “ok, we can go home now.”

36. 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
37. 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
38. 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)
39. 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 pademelons
40. 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"
41. 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?"
42. 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 observer to take photographs with their camera • Looking at photographs on camera, discussing how good looking guys on their cameras are

43. 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 • Digitising of physical items to make transfer easier	• Explained how to send packages • Storing photographs 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
44. 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 not 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
45. 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 is a tourist information office?" • Talking about need for rain gear
46. 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
47. 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

48. Find Other People Similar To Me.	Some questions are best answered by those in a similar situation and sometimes it is 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
49. Find A Friendly Local	Locals have information travellers do not.	• Reputation system • Public meeting spots • Excuses to meet	• Asking about whether observer if has Australian residency • Asking observer about what degree he is doing • They are asking about how kangaroos exist in ""the real world"
50. 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
51. 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"
52. 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
53. How Did Others Handle This?	Official information does not 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 observer about how long it takes to go around the park

54. 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
55. 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
56. 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
57. 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

D. Backpacker Interviews: Information Flyer

Got a spare 20 minutes?

We want to learn what it takes to be a backpacker!

University of Queensland researchers would like to interview you about how you travel and what kind of stuff you pack around with you.

What's the research for?
We are interested in designing technologies and services to make backpacking easier, safer and more fun! Do this we need to know what you would like and how you travel currently.

What will I need to do?
We'd like to ask you a few questions about where you've traveled, what you think of being a backpacker and what kind of gear you bring with you. Its great if you can bring your backpack to show us stuff!

How will my comments be used?
The interviews will be recorded anonymously. It will be used in reports to guide the design of future products and services for backpackers.

Can I be interviewed here?
Yes. We run all interviews in the hostel.

I want to, but I'm busy now!
Please schedule an interview time with us. We would like to talk with you!

Who is running the studies?

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In affiliation with:

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

acid AUSTRALASIAN SIG FOR INTERACTION DESIGN

E. MIS-1 Study: Consent Form

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

'Mobile Information Sharing' Research Study

Consent Form

For the purposes of the study, I understand that I will be asked to do the following tomorrow:

1) Answer a short pre-test questionnaire. (15 min)
2) Participate in a discussion concerning the purpose of the study. (25 min)
3) Walk from the hostel to North Quay jetty. (20 min)
4) Take a boat cruise to the Koala Sanctuary. (1 hr)
5) Tour the Koala Sanctuary on foot. (2 hr)
6) Boat back. (1 hr)
7) Walk back from the jetty. (20 min)
8) Participate in a 2 hour workshop upon returning to the hostel. (2 hr)

I understand that my actions and communications will be recorded throughout the study via a microphone that I will wear, and a roving video-camera which will be present the entire day. This information will be used to better understand how groups communicate while engaged in mobile activities.

I understand that my communications may be published in several research papers, but all names will be changed in any published research. However, audio and video clips may be used during presentations about the study.

My participation is entirely voluntary. I understand that I can discontinue participation at any time without penalty. However, I will inform the researchers now if there will be any planned disruptions to participating from 8:30am – 5pm.

My signature below indicates that I have read and understood the information provided above.

Participant Signature: _ Date: 17/03/2005

Form in which participants were informed of their rights and what would be expected of them.

F. MIS-1 Study: Pre-study Questionnaire – Page 1&2

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

'Mobile Information Sharing' Research Study

Questionnaire

Please fill out this questionnaire now to complete your registration.
It won't take long!

Name: _____

This research study concerns what travel experiences are shared amongst backpackers and what they would like to know while they travel. For this reason we would like to ask a few questions about your recent travel experiences for use during a group discussion tomorrow.

Please reflect on your recent travel experiences and tell us a bit about your current situation below.

1. Where are the **last five locations you have been**?

(These should be different cities or distinct places you have recently traveled to. If you are just starting your trip you can use your home country or previous travel experience.)

	Location	Activities you did there
a)	surfer's paradise	partying and going to the beach
b)	Byron Bay	partying, going to the beach, siteseeing
c)	Lismore	wwoofing
d)	Nimbin	wwoofing
e)	Byron Bay	Ending my Sydney / Byron roadtrip whit a big party.

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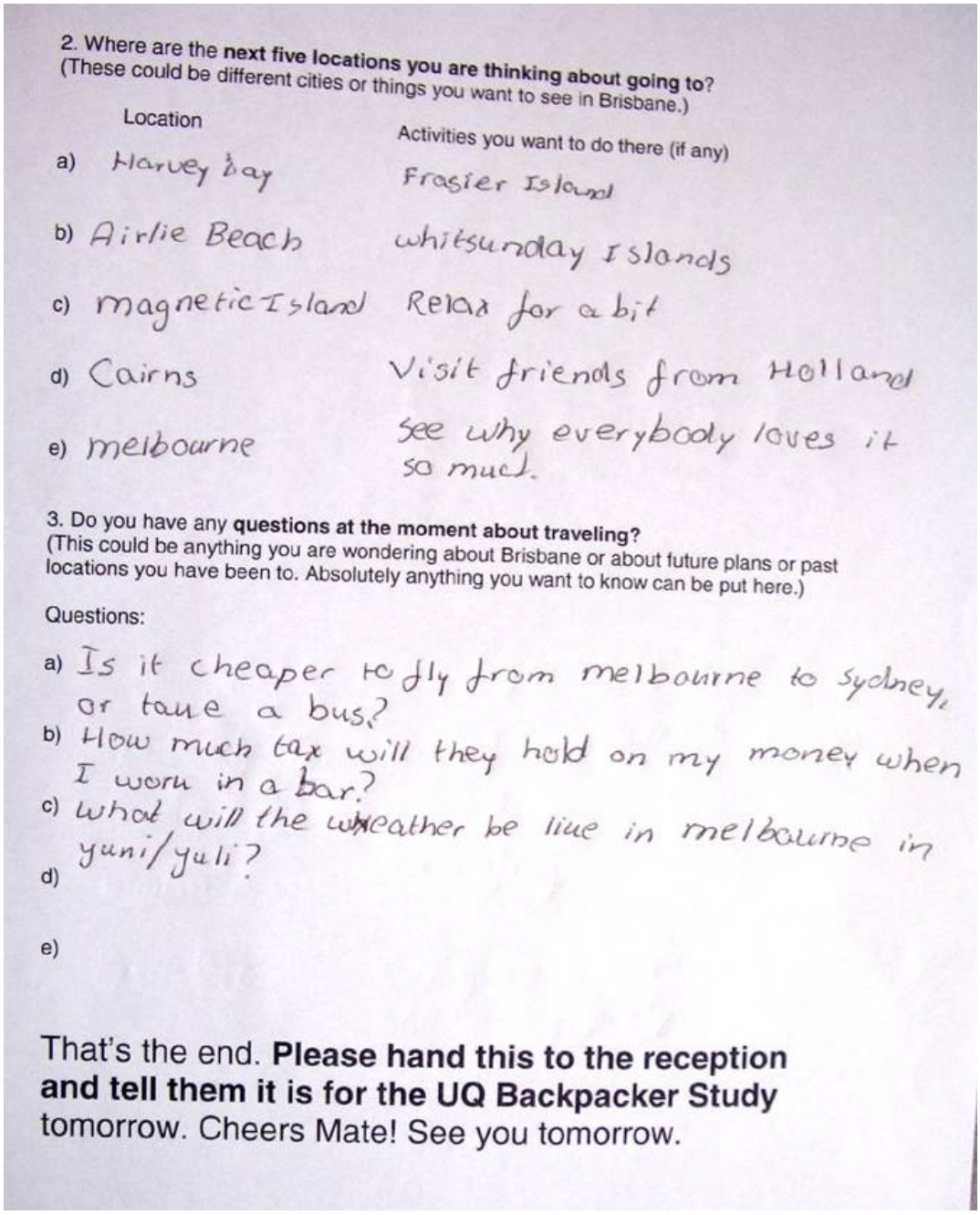

2. Where are the **next five locations you are thinking about going to?**
(These could be different cities or things you want to see in Brisbane.)

	Location	Activities you want to do there (if any)
a)	Harvey bay	Frasier Island
b)	Airlie Beach	whitsunday Islands
c)	magnetic Island	Relax for a bit
d)	Cairns	Visit friends from Holland
e)	melbourne	see why everybody loves it so much.

3. Do you have any **questions at the moment about traveling?**
(This could be anything you are wondering about Brisbane or about future plans or past locations you have been to. Absolutely anything you want to know can be put here.)

Questions:

a) Is it cheaper to fly from melbourne to sydney, or take a bus?
b) How much tax will they hold on my money when I work in a bar?
c) what will the weather be like in melbourne in yuni/yuli?
d)
e)

That's the end. **Please hand this to the reception and tell them it is for the UQ Backpacker Study** tomorrow. Cheers Mate! See you tomorrow.

The Pre-study Questionnaire asked questions about where people had travelled, or were planning to travel in the near future.

G. MIS-1 Study: Post-study Questionnaire – Page 1&2

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

4

'Mobile Information Sharing' Research Study

Post-study Questionnaire

All answers will be anonymized in any published research.

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?

Scale is **0 (never or very low)** to **4 (often or very high)**

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	4	1	0	
c) How **strong is the bond** between you?	1	2	3	1	0	
d) How much do you **trust travel information** from this person?	3	2	3	3	2	

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

2. 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.

	Location	Activities you want to do there (if any)
a)	Harvey Bay	Fraser Island

Did you discuss with other group members today? ☐ No ☒ Yes, with whom? Kevin, Seung

b)	Airlie Beach	Whitsunday Islands

Did you discuss with other group members today? ☐ No ☒ Yes, with whom? Kevin

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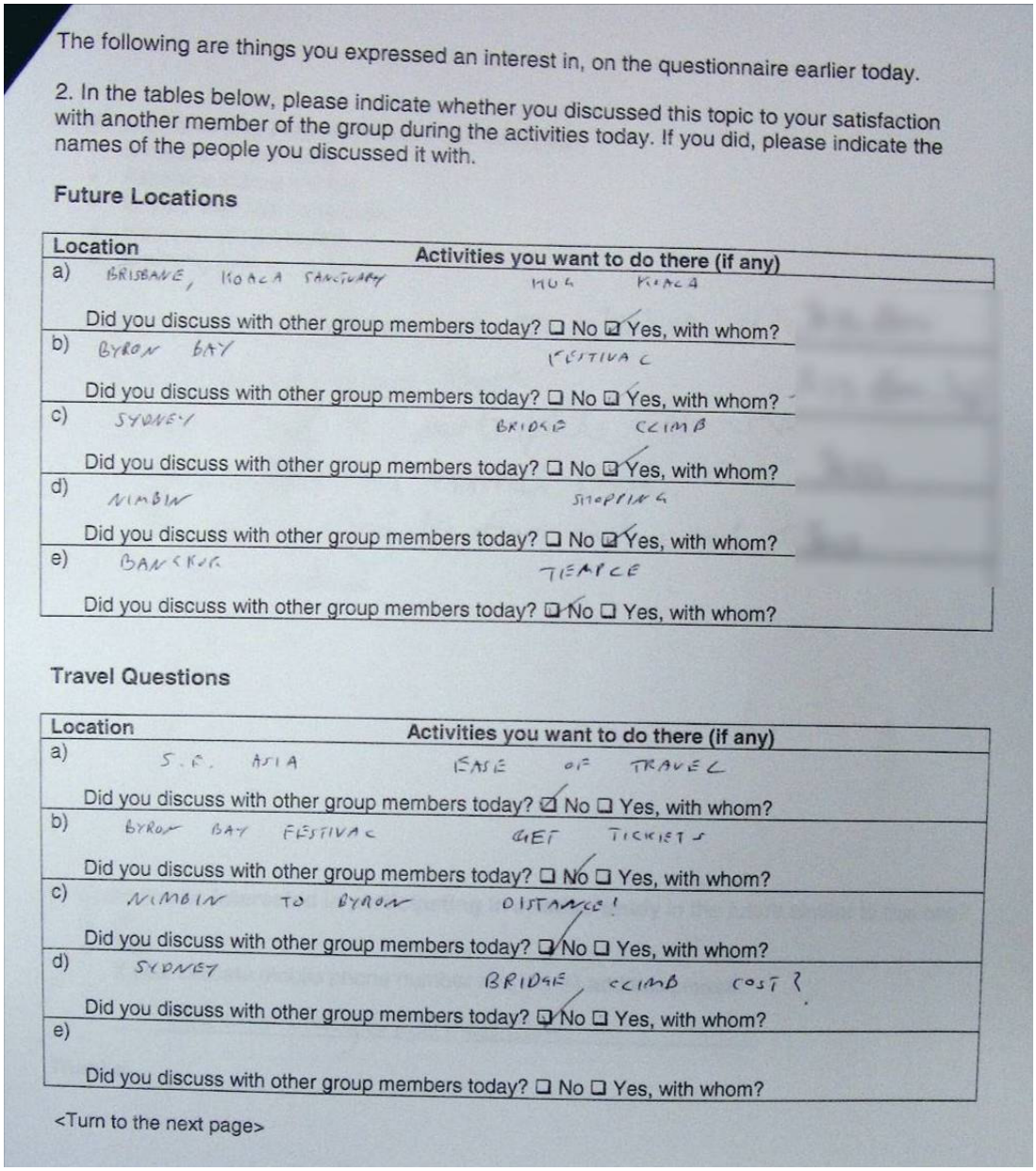

The following are things you expressed an interest in, on the questionnaire earlier today.

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?	

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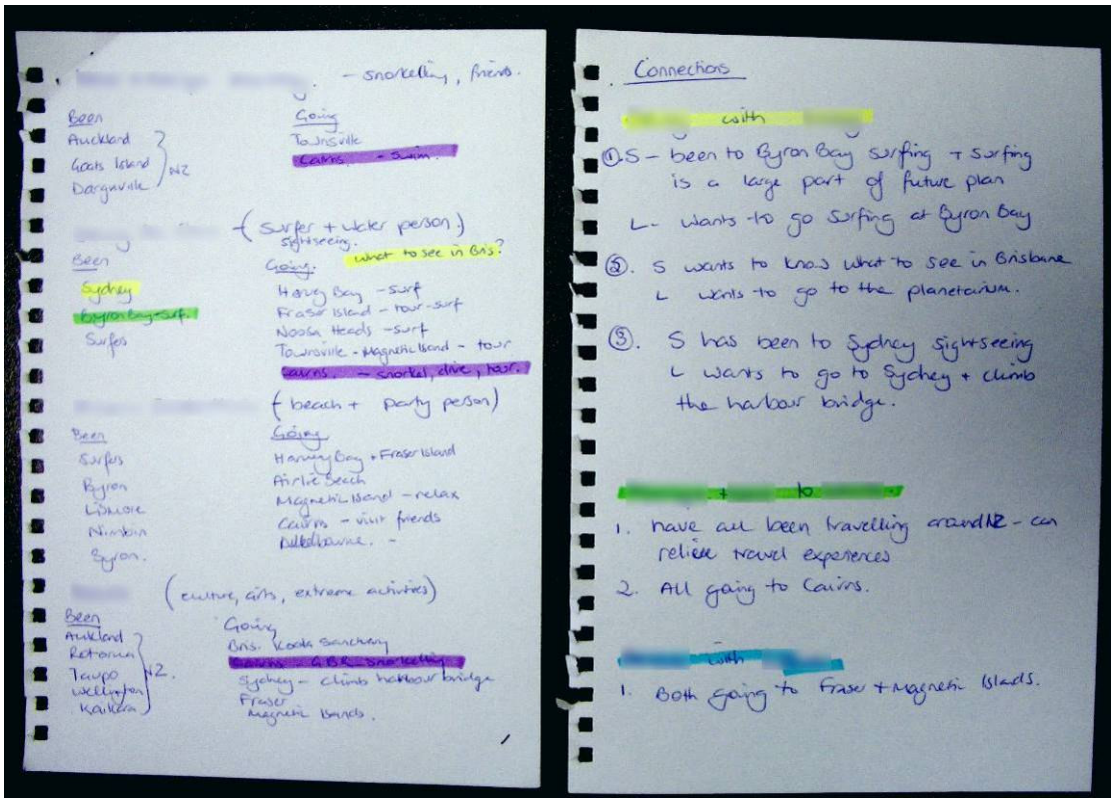
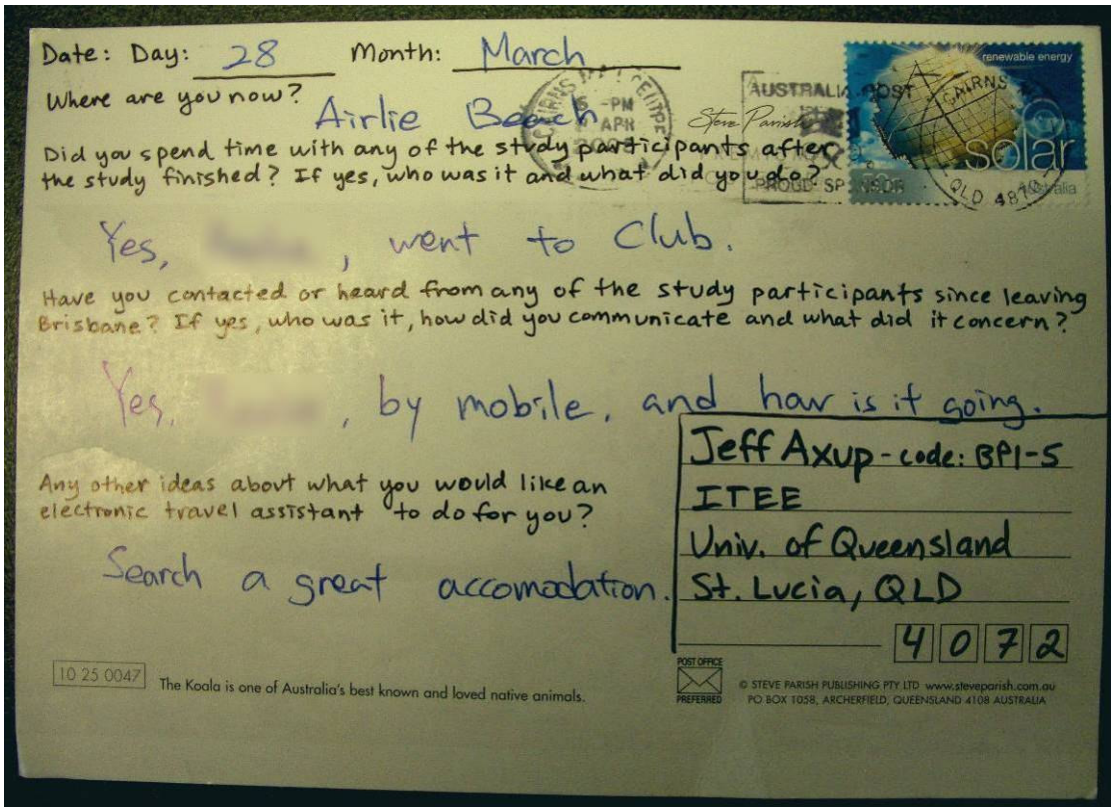
The Post-Study Questionnaire questions explored how the group of backpackers felt about each other after the field trip and which discussion they had had with other backpackers from the list of questions they had previously expressed an interest in.

H. MIS-1 Study: Pairing Charts



A pairing chart created by an experimenter. On the left, there is a category for each backpacker and a section for “been” and “going”. On the right is a connections section, with a sub-section for each backpacker pairing.

I. MIS-1 Study: Returned Postcard

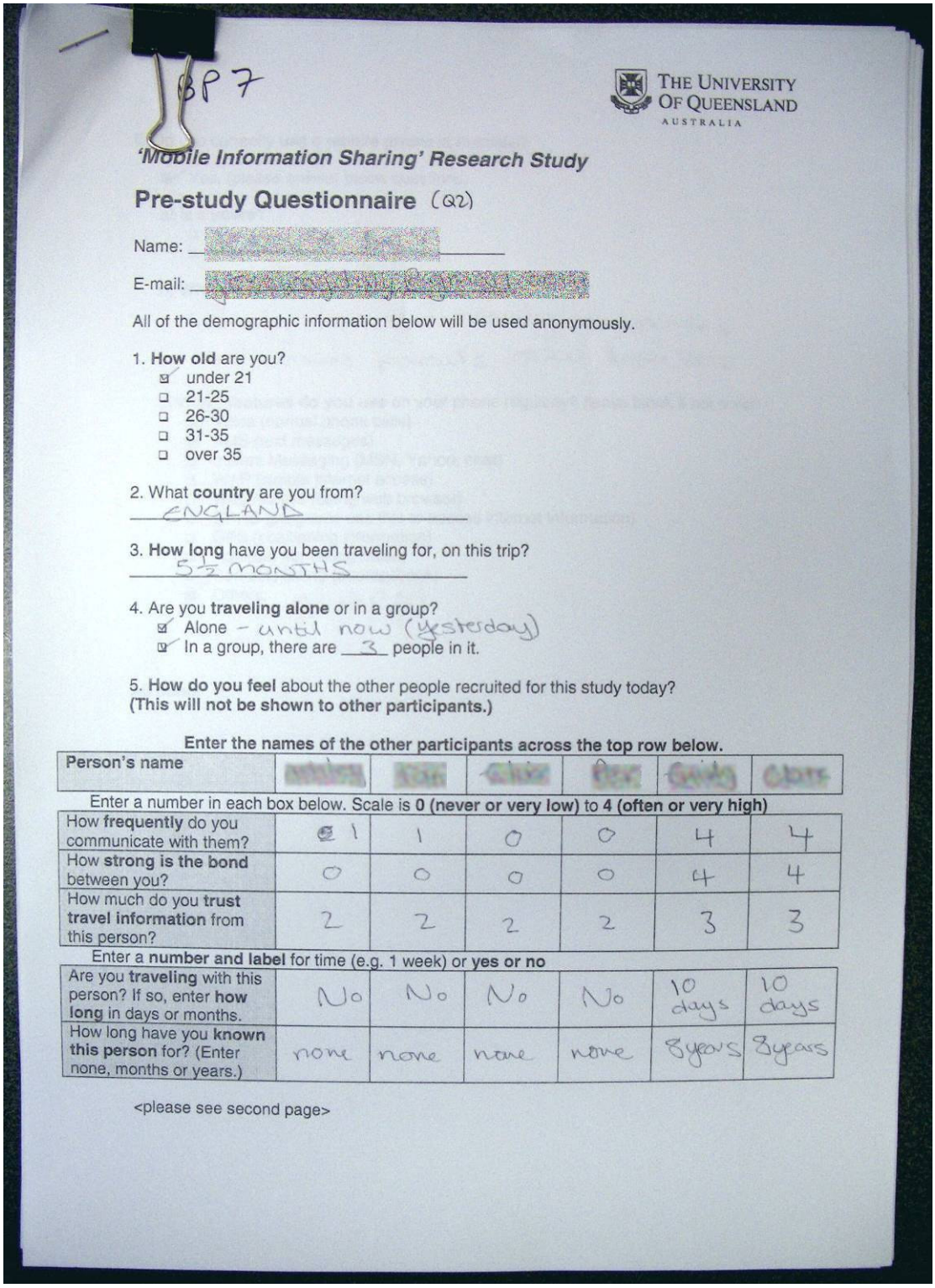


A postcard returned from the study which shows a backpacker did an activity with another participant following the study. They also communicated by mobile to say hello. The locations were used to determine accuracy of projected travel plans and movement patterns.

J. MIS-1 Study: A Cruise Ticket

A cruise ticket for the cruise to Lone Pine.

K. MIS-2 Study: Pre-study Questionnaire



BP7

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

'Mobile Information Sharing' Research Study

Pre-study Questionnaire (Q2)

Name: [redacted]

E-mail: [redacted]

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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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.

L. MIS-2 Study: 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**						

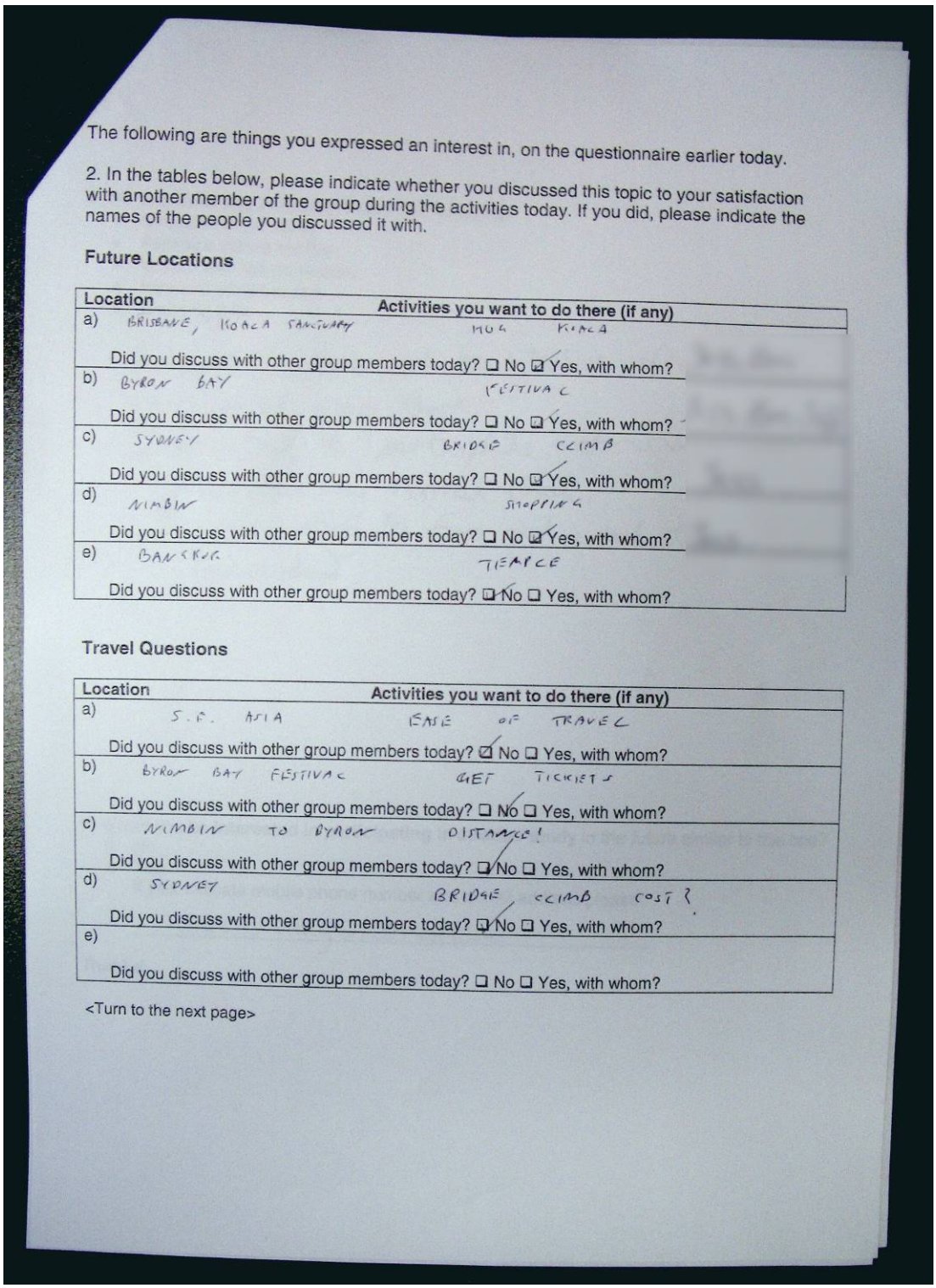
Enter a number in each box below. Scale is **0 (never or very low)** to **4 (often or very high)**

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.

M.MIS-2 Study: 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	MUG 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?	

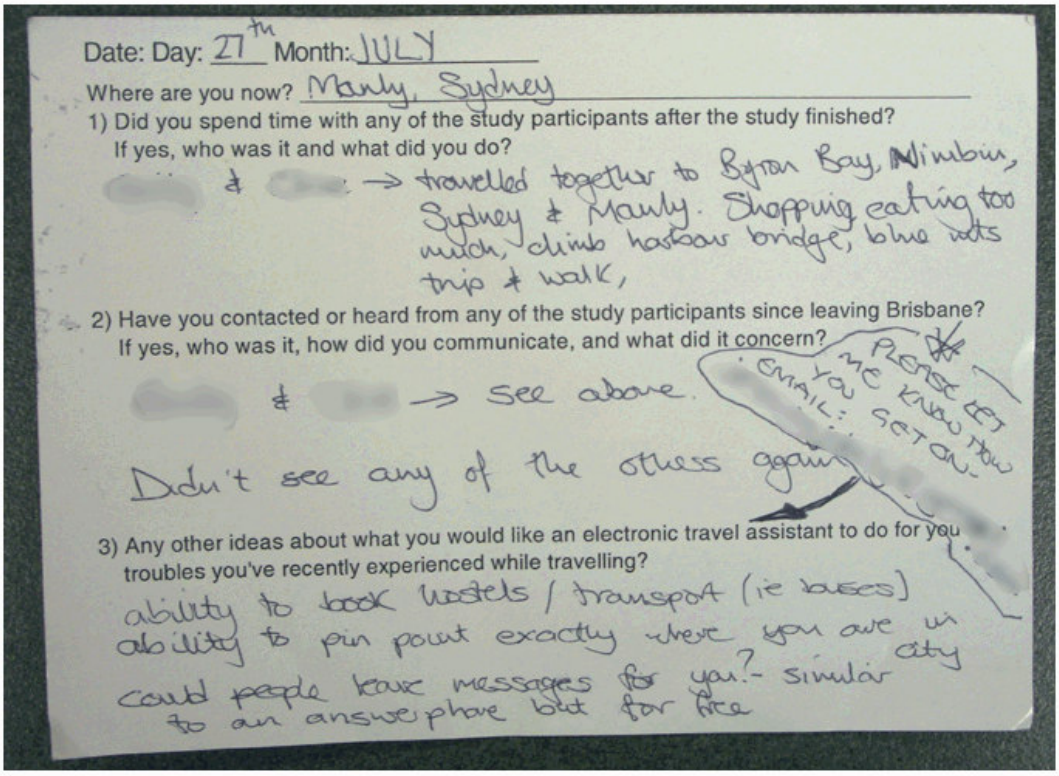
Travel Questions

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.

N. MIS-2 Study: Returned Postcard



Date: Day: 27th Month: JULY

Where are you now? Manly, Sydney

1) Did you spend time with any of the study participants after the study finished?
If yes, who was it and what did you do?

[redacted] & [redacted] → travelled together to Byron Bay, Nimbin, Sydney & Manly. Shopping, eating too much, climb harbour bridge, blue mts trip & walk,

2) Have you contacted or heard from any of the study participants since leaving Brisbane?
If yes, who was it, how did you communicate, and what did it concern?

[redacted] & [redacted] → see above.

Didn't see any of the others again

PLEASE LET ME KNOW YOU EMAIL: SETON.

3) Any other ideas about what you would like an electronic travel assistant to do for you
troubles you've recently experienced while travelling?

ability to book hostels / transport (ie buses)
ability to pin point exactly where you are in city
could people leave messages for you? - similar to an answer phone but for free

Please fill out the reverse side and drop this postcard in a red AusPost mail box (or at some hostels) anywhere in Australia.

Postage has already been paid.

Thanks!

7

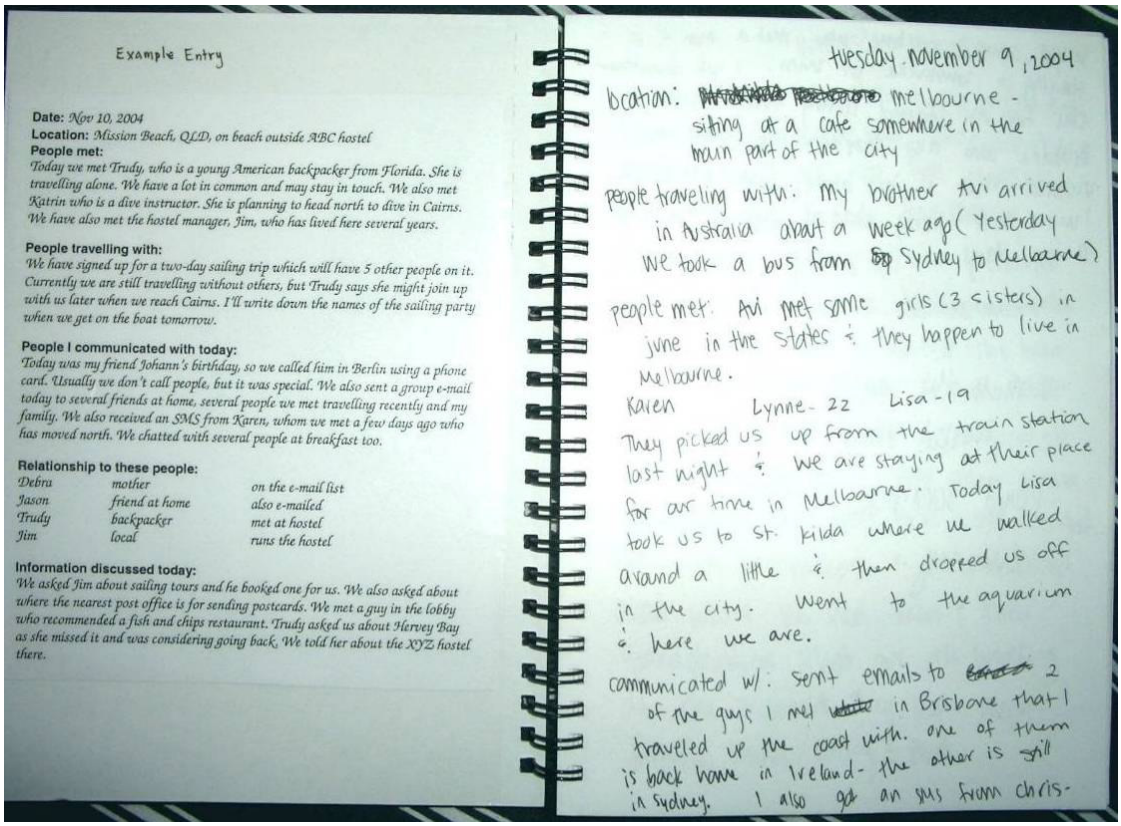
Delivery Address:

No stamp required if posted in Australia

Jeff Axup (438)
Information Environments BP-PC1
[redacted]
ST LUCIA QLD 4067

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

O. Diary and Blog Studies: Paper Diary Entry



Example Entry

Date: *Nov 10, 2004*
Location: *Mission Beach, QLD, on beach outside ABC hostel*
People met:
Today we met Trudy, who is a young American backpacker from Florida. She is travelling alone. We have a lot in common and may stay in touch. We also met Katrin who is a dive instructor. She is planning to head north to dive in Cairns. We have also met the hostel manager, Jim, who has lived here several years.

People travelling with:
We have signed up for a two-day sailing trip which will have 5 other people on it. Currently we are still travelling without others, but Trudy says she might join up with us later when we reach Cairns. I'll write down the names of the sailing party when we get on the boat tomorrow.

People I communicated with today:
Today was my friend Johann's birthday, so we called him in Berlin using a phone card. Usually we don't call people, but it was special. We also sent a group e-mail today to several friends at home, several people we met travelling recently and my family. We also received an SMS from Karen, whom we met a few days ago who has moved north. We chatted with several people at breakfast too.

Relationship to these people:

Debra	*mother*	*on the e-mail list*
Jason	*friend at home*	*also e-mailed*
Trudy	*backpacker*	*met at hostel*
Jim	*local*	*runs the hostel*

Information discussed today:
We asked Jim about sailing tours and he booked one for us. We also asked about where the nearest post office is for sending postcards. We met a guy in the lobby who recommended a fish and chips restaurant. Trudy asked us about Hervey Bay as she missed it and was considering going back. We told her about the XYZ hostel there.

tuesday november 9, 2004

location: melbourne - sitting at a cafe somewhere in the main part of the city

people traveling with: my brother Avi arrived in Australia about a week ago (yesterday we took a bus from Sydney to Melbourne)

people met: Avi met some girls (3 sisters) in june in the states & they happen to live in Melbourne.
Karen Lynne - 22 Lisa - 19
They picked us up from the train station last night & we are staying at their place for our time in Melbourne. Today Lisa took us to St. Kilda where we walked around a little & then dropped us off in the city. Went to the aquarium & here we are.

communicated w/: sent emails to 2 of the guys I met in Brisbane that I traveled up the coast with. one of them is back home in Ireland - the other is still in Sydney. I also got an sms from chris-

Paper diary showing an example entry at the beginning on the left and a completed entry on the right.

P. Diary and Blog Studies: Types of Transport

40 types of transport shown in backpacker photos.

4WD busses
4WD jeeps
ATVs (3 or 4 wheel motorcycle)
Bikes, tricycles
Cable cars
Camels
Campervans
Canoes
Cars
Dinghy (small motorboat)
Elephants
Escalators
Full-size busses
Hangliders
Helicopter
Horses
Jet skis
Large passenger aircraft
Log rafts
Longboat
Minivans
Monorails
Motor homes
Motorcycles
Off-road dune buggies
Older passenger boats
Oxen
Parachute
Passenger ferries
Pickup trucks
Rafts
Sailboats
Scooters
Small airplanes
Songthau
Speedboats
Theme park cart
Trains
Tuk tuks (small motor-powered taxis)

Q. Diary and Blog Studies: Group Activities

100 types of activities depicted in backpacker photos.

Activity	Location
Bouncing soccer ball	On beach
Carrying lit fireworks dressed in uniforms	On street in Festival
Cooking food over fire	On beach
Crouching near sign	On top of cliff near path
Dancing in costumes	Outside on ground
Dancing in large group	At club
Dancing in large group	On street (festival)
Drinking from coconuts from straws	Outside restaurants on street
Eating dinner around table	In house
Gambling	Lying on grass on towel
Jumping at stove while cooking	In kitchen
Kids playing	Outside in village
Kids sitting on benches	Outside in city
Kids standing in school clothes	On road
Laying on large couch	In house
Lying down in row near van	In middle of road
Lying down on lounges under umbrellas	Long stretch of beach
Lying on grass with beer	(concert)
Matrix Agents posing for camera	On street (Universal Studios)
Posing in costumes (Halloween) at party	In Kitchen
Posing with fishing rods	Back of boat
Racing horses	At race track
Riding Camels	In desert
Riding Motorcycles	On small street
Running out of water	At lake on beach
Sailing	Large sailboat
Singing karaoke with microphone	In bar
Sitting (talking)	In tent
Sitting (using computers)	In internet café
Sitting and holding dog	Around dinner table
Sitting and laughing	In small van
Sitting around fire roasting marshmallows	Outside (campground)
Sitting around table	In bar
Sitting around table drinking	At hostel
Sitting eating and drinking	On deck of boat
Sitting In back of truck	Driving
Sitting in bleachers	Watching soccer game
Sitting in chairs, drinking	In kitchen
Sitting in chars	On Passenger plane
Sitting in hot tub with steam	Outside near grass
Sitting in seats	In Tuk Tuk (taxi) in traffic
Sitting on boat	In front of opera house
Sitting on grass playing music	Outside (back yard)
Sitting on porch	Outside house
Sitting on top of elephant	In countryside
Sitting on wall	At restaurant overlooking lake
Sitting playing music	In wooden hut

Sitting preparing to parachute	In small plane
Sitting watching	In Stadium
Sitting watching trees	In small motor boats
Sitting with baggage	Wooden deck on boat
Sitting with shoes off and bag down	On beach in sand
Sitting with women in uniform	Office (customs, travel agent?)
Sitting, holding hands to ceiling	In small van
Skiing holding each other	On hill covered in snow
Standing	In cave
Standing	In library with book shelves
Standing	On hill top in front of mountains
Standing around stone marker	Top of Uluru
Standing at lookout	Cliff over ocean around islands
Standing by fence	On walkway near beach
Standing by sculpture	On beach
Standing holding each other	On beach
Standing holding shot glasses to lips	In apartment
Standing in front of 4WD bus	On beach
Standing in front of bus	On road
Standing in front of message in sand	On beach
Standing in front of navy ship	In harbour
Standing in funny poses	On sand dune
Standing in parachuting gear	At airport
Standing in rain jackets	In front of waterfall
Standing in tightly packed crowd	Bar with lots of decorations
Standing moving diving gear	Back of dive boat
Standing near rock outcropping	On path near large valley
Standing near steering wheel	On large boat
Standing next to sign	At beach on island
Standing on rock outcropping	In scenic desert
Standing on tables with hands in air	Large room
Standing outside gates watching	White House
Standing sweaty in boxing uniform	(in boxing ring)
Standing watch ocean	On cliff near cars
Standing watching (camel race)	On road
Standing wearing uniform	In storeroom with supplies on shelves
Standing with beers	On beach
Standing with other passengers	Crowded boat upper deck
Standing with surfboards	On beach
Standing, dressed up	Wedding
Sunbathing on deck	Boat
Walking	Along edge of pool, near beach
Walking and looking	In temple complex
Walking in crowds at night	On busy street
Walking in group at night	Down Street
Walking in street getting wet	Festival (Thailand)
Walking near wall on grass	In field
Walking on street	Big buildings (Moscow)
Walking with camera equipment	Outside near houses
Walking with large plastic balls	In street (festival)
Watching guy sliding down	Large sand dune
Watching kid chased by bull	(Bull festival in Spain)
Watching oriental dance	In large building with stage

R. Diary and Blog Studies: Challenging Situations

50 challenging situations shown in backpacker photographs.

Situation	Challenges
Boxing in ring	Getting punched, no items carried
Climbing to top of temple stairs	It is a lot of stairs, easy to fall
Cooking on barbeque	Cooking style, operating BBQ
Costume party	Finding costumes, identifying others
Drinking at hostel table	Not falling over, hangovers
Drinking in crowd in bar	Talking to people over noise, moving
Driving 4WD in desert	Sand, remote area, no communications
Entering backpackers	Checking in, finding nearby amenities
Fishing from rock in surf	Wave danger, sharp rocks
Guy in bar with girl	Ordering drinks, meeting new people
Guy reading with bottle of wine	Where to buy wine, where to read quietly
Hiking in rocky canyon	Remote area, getting lost, no water
Hiking near waterfall	Carrying items in small bag, food
Hiking up long mountain trail	Sun, water, fatigue, heavy backpack
In dance club dressed up	Crowded, no place to set items down
In temple complex	Walking long distances all day
Kids posing for picture	Giving money/tips, culture, language
Kissing local girl at bar	STDs, local customs, prophylactics
Large outdoor music festival	Camping, bathrooms, dirt, navigation
Lavish dinner with many bottles	Money
Locals crowding bus to sell items	Barter, language, identifying food
On top of mountain in snow	Cold, wet, slippery, high altitude
People standing in water festival	Getting wet, crowds
Playing in waterfall	Getting wet, storing items
Playing with child in village	Local customs
Posing with marijuana pipe	Legal issues, quality issues, safety
Posing with roo for photo	Positioning of roo, information about roo
Posing with soldiers	Customs, weapons
Riding backpacker tour bus	Loud, annoying people, see same people
Riding elephant	Staying on top, being uncomfortable
Riding in back of pickup	Comfort, problem if crash
Riding long canoe	launching boat, keeping items dry
Sitting in café	Very small chairs, ordering
Sitting in café near motorbike	Riding motorbike, rentals, ordering food
Sitting outside rental house	No clothesline, no chairs
Standing near hot spring	Bad smell, sun glare
Standing near of national park sign	Too much gear, heavy, rain
Standing near raging river	Spray and mist, rogue waves
Standing on beach	Water, sand, sun
Standing on boat deck	Sun, dropping items in water, storms
Standing on bridge being repaired	Road is not passable
Standing on tilting sailboat deck	Holding on, walking, very wet
Standing with porters and trolley	Tipping, rates, gear safety

Teaching native kids	Language, customs, facilities
Touching koala in tree	Learning effect on koala
Walking in Moscow	Languages, customs, side of street
Walking in shrine area	Crowds, navigation, where can take pictures
Walking through busy streets	Pickpockets, navigation, reading signs
Walking through forest	Wet ground, animals
Walking through shallow stream	Getting gear wet, tripping

S. Diary and Blog Studies: Objects of Interest

50 objects of interest which backpackers photographed.

Ancient statue
Artwork in park near ocean
Backpacker locked in clothes washer
Bar sign on fire
Bathtub with surfboard
Birthday cake
Blood on sheets in hostel
Buddha statues in temple
Butterfly on leaf
Camper van with 'Wicked' on side
Can of VB beer and glass
Candles in monastery
Christmas tree
Distance to other world cities sign
Dolphin in ocean
Donuts on table
Dragon statue
Drawing in sand
Emu crossing sign
Food products for sale on ground
Food supplies in wood boat
Fountain in plaza
Goats lying down
Kangaroo in field
Large clam in ocean
Large red cocktail
Large rocks in circle
Mass grave sign
Mural on subway wall
Old broken bus in desert
Old scary masks
Ornamentation on top of building
Paintings on Vatican ceiling
Rock cairn
Rock carving in wall
Route 66 sign
Sailboat in ocean
Shark in tank
Sign in front of Australia Zoo
Sign warning of limited water
Skulls in box
Space shuttle
Statues of people in museum
Stingers warning sign
Strange dead fish on beach
Tibetan prayer wheel
Trail sign on hiking trail

Truck in ditch
Twelve Apostles park sign
Very old truck
Wipe on sex appeal' bathroom ad