

11 User Requirements for Location-Based Services to Support Hiking Activities

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Abstract

Location-based services (LBS) are gaining popularity and being adapted to new domains. The aim of this study was to identify user requirements for location-based information and services to support outdoor hiking activities. Two issues were emphasized in the study: possible changes occurring during a hike, and community and content needs of the hikers. Three usability engineering methods (questionnaires, empathy probes and focus-group discussions) were used to identify the potential users and their tasks during a hike. Approximately 100 specific user requirements for development of future location-based services were recognized, from which nine major themes were identified: planning a hike, additional information on the hiking area, 'I am here' services, location of other hikers, changing conditions, emergency situations, saving experiences, sharing experiences, and integrated and adaptive services for hiking purposes. This paper describes the test set-up to identify user requirements and discusses the critical requirements from the hiking viewpoint. Fulfilling these requirements enables the development of improved applications, services and devices for outdoor activities.

Keywords: user requirement study, location-based information, mobile device, outdoor activity

11.1 Introduction

Today, location-based services (LBS) are an emerging research topic. The potential of location-based services has been recognized along with the rapid development of mobile Internet devices, next generation mobile networks and accurate positioning technologies. LBS can provide users of mobile devices with personalized services tailored to their current location or other location of interest. According to a market research study (Research and Markets 2005), the global LBS and Geographical Information System (GIS) market started to accelerate in 2005 and is considered to be the next 'killer' service after SMS. A review on topics and future trends presented at Mobile Location Services conferences in 2006 and 2007 shows that there are already many successful applications available today, especially in the domains of emergency and personal security, car and pedestrian navigation, tourist information, and fleet, asset and workforce management (MLS 2006, 2007).

However, there is great potential for many other location-based application domains as well, especially now with the growing number of GPS-equipped mobile phones. These mobile phones are becoming part of people's everyday lives, and their role is no longer that of a traditional phone but of a multimedia computer optimised for entertainment consumption. Similarly, the usefulness of LBS is no longer considered only in the traditional sense, for example in guiding the user in unfamiliar environment; instead, people want services that are also fun, entertaining and with aesthetically pleasing user interfaces. Information and communication technologies have also changed people's leisure-time behaviour, as socializing today often takes place through SMS messaging and online meetings. Another trend is the emerging social services like Jaiku and Facebook (Jaiku 2007, Facebook 2008), through which people create different communities and communicate, for instance, with friends or people with the same interests. People use their mobile devices for accessing these services, as well as for creating their own content and sharing their experiences with others (Lehikoinen et al. 2007).

In line with current trends, the potential applications for future LBS are related to friends, location-based gaming, commerce, communities and social networking (MLS 2006, 2007). The problem with these types of applications is that the perceived value for the consumer is often not so obvious. In order to make successful products, the key issue is how to understand the potential users of the service.

Hiking is a popular activity in many countries, and for example Finnish national parks have become increasingly popular during the past decades. The Finnish Forest Research Institute, Metla (2006), reports that nowadays there are over one million visits to national parks every year. Every fifth citizen uses the national parks and other state-owned areas for recreation, and the average person visits these areas seven days per year (Metla, 2006). Clearly, there is a large base of potential users who would benefit from location-based services designed especially for hikers.

11.1.1 The Goal of the Study

The research presented in this paper was part of the Nokia Research Center's (NRC) larger research project that aimed at studying different aspects of location-awareness in the context of outdoor navigation. The hypothesis of the present study was that hikers, and also people engaged in other rural outdoor activities, would benefit from location-based information that would – in addition to wayfinding instructions – support users' communication and social behaviour needs.

The goal of the study was to define the user requirements regarding the geospatial and other location-based information – focusing on the needs of people interested in hiking and related outdoor activities. The aim was to gather qualitative information about how hiking and other rural outdoor activities are currently planned and carried out and to observe the potential problems in carrying out these tasks today. The objective was to use the collected information to compile a set of user requirements to further develop LBS for hikers.

In addition to the general user requirements, the study focused on finding answers to the following research questions:

1. What type of unexpected changes may occur during the hike and what needs these situations cause for the hikers? What type of support actions would help hikers to recover from and adapt to these sudden changes?
2. What type of community and content needs the hikers may have while hiking? Are there some benefits that LBS could offer; for example; what type of needs do hikers have in relation to creating and sharing their own content while hiking? What kind of content should be provided for them, and how could it be used while carrying out an outdoor activity? How would hikers benefit from knowing the location and other information about the other hikers?

11.1.2 Related Work

Research on LBS has, so far, mainly focused on personal navigation in urban settings. The market potential of LBS supporting tourism and personal navigation has been recognized in many studies (Brown and Laurier 2005, Pospischil et al. 2002, Schmidt-Belz et al. 2003, Cheverst et al. 2000, van Setten et al. 2004). Furthermore, the user requirements have been identified for supporting personal navigation in an urban area (e.g. Baus et al. 2002, Bornträger et al. 2003), or for specific user groups (elderly people: Osman et al. 2003, blind people: Klante et al. 2004, Goodman et al. 2004). Studies on location-based information on mobile devices have also been carried out, such as the LoVEUS (2005). The research on identifying user requirements for future LBS, as carried out in this study, could provide preliminary input for the LBS research topics listed by Raper et al. (2007):

user profiling, orientation support, interaction design, geographical relevance or context, and geospatial content management.

Extending the research to the outdoor domain potentially reveals new ideas and designs that can be generalized for application and UI concepts. To date, only few studies have been published on hikers' needs for location-based information in non-urban areas, as presented in this paper. An LBS prototype for hikers was developed in a project named PARAMOUNT and validated in test areas in the Alps and Pyrenees (Sayda 2005). User requirements were gathered with a survey questionnaire posted on a website (PARAMOUNT 2002). The final prototype provided topographic maps, routing functions, tourist information on points of interest (PoIs), local weather forecasts, etc. Hikers' user requirements have also been studied in WebPark (Edwardes et al. 2003), and GiMoDig (Sarjakoski & Sarjakoski 2005) projects.

One of the major challenges for future LBS is to support user activities by providing contextually-adapted information through mobile devices. Discussion on how to utilize the information of a user's location in more intelligent ways has been ongoing for several years (e.g. Meng et al. 2005, Nivala & Sarjakoski 2003, 2007, Reichenbacher 2004, Zipf 2002). Nivala and Sarjakoski (2003) stated that besides the most important context for mobile map services today, the location of the user, there are also other important context to which the service should adapt to: the system used, purpose of use, time, physical surroundings, navigational history, orientation, user and cultural and social context. However, Beeharee and Steed (2007) observed that adaptive systems have, so far, been rather naive in relation to what information is relevant for the user. Gartner (2004) also stated that today adaptation to the 'user' means being limited to user profiles selected in advance from a list or entered manually by users themselves.

11.2 Materials and Methods

The potential future LBS users were contacted, and the user requirements were studied with three different usability engineering methods: questionnaires, focus-group discussions and empathy probes. The motivation to use multiple methods for answering the same research questions was to gather qualitative information on as many aspects as possible, as each of the method had a slightly different emphasis on the research topics. Each user participated in only one of the methods. The study was carried out together with the Nokia Research Center and the Finnish Geodetic Institute, Department of Geoinformatics and Cartography, during summer and fall 2007.

11.2.1 Questionnaires

Questionnaires are used to gather information about the users, such as, their skills, experience, work practices, preferences and opinions. The questionnaire in the present study was eight pages long and started by gathering quantitative information about users' backgrounds, such as age, gender, frequency of outdoor activities and previous experience with maps. The main part of the questionnaire consisted of open questions aiming to collect qualitative information on users. The topics of the questions were related to different aspects of hiking, such as route planning, guidance material taken on the hike, current use and opinions of real-time positioning, user experiences during the hike and attitudes to sharing their experiences with other people, surprising situations the users had encountered during their hikes and users' ideas of 'dream devices' to support hiking trips.

A total of 38 printed questionnaires were distributed to random hikers in two different locations: Nuuksio National Park in southern Finland, which mainly attracts daytime visitors, and Pallas-Yllästunturi National Park in northern Finland, where hikers usually stay overnight. The researchers recruited the participants at the camping sites in the national parks.

The participants were aged from 30 to 65 years in Nuuksio, and from 15 to 54 years in Pallas-Yllästunturi. In Nuuksio, nine females and nine males participated, and in Pallas-Yllästunturi nine females and eleven males. The length of their route varied from 1.5 to 20 km in Nuuksio, and from 10 to 60 km in Pallas-Yllästunturi. The duration of their hike was from 1 to 10 hours in Nuuksio and from 25 hours to 9 days in Pallas-Yllästunturi.

11.2.2 Focus-Group Discussions

Focus-group discussions are used to obtain user feedback and initial reactions to discussion topics (Caplan 1990). The interaction between the participants often prompts spontaneous reactions and ideas. In this study, the topics of the focus-group discussions were mainly the same as the topics in the questionnaires, but there were also additional questions about the community needs during a hike. Two researchers lead the two hour discussions, and audio data were recorded for analysis purposes.

The focus-group discussions were carried out in two separate sessions, with two different groups of people sharing similar interests in relation to hiking. Participants in the first group were interested in outdoor activities (e.g. hiking, cycling, canoeing, bird observing) and belonged to an association that aims to support outdoor activities among its members. The group comprised of five people aged 29 to 61 years.

The second group consisted of eight students from a sports institute, aged 18 to 20 years. Their outdoor activities were mainly related to their future work tasks, such as guiding customers at different outdoor events.

The lengths of typical outdoor activities varied between the two groups: the first group had experience of longer hiking trips to northern Finland, while the second group typically arranged shorter, one-day outdoor activities with different themes, such as activity days for students or recreation days for companies, but occasionally also longer hiking or canoeing trips. The hiking group sizes for both groups were typically between 10 and 20, depending on the event.

11.2.3 Empathy Probes

In order to gather information on and to understand the users' thoughts, feelings, dreams, experiences and lives, several participants were asked to keep diaries (i.e. empathy probes) during their hiking trip. The word 'probe' refers to a recording device that can be carried around by the user, i.e. to places where the researcher cannot go. The probe can be, for example, a recorder, diary or a disposable camera (Koskinen et al. 2003).

The empathy probe in this study was 24 pages long diary, which was designed to be attractive, fun to fill with lots of colourful pictures (*Figure 11.1*), and easy to carry during the hike (A5 size, waterproof covers). The structure of the diary followed the same topics as the questionnaires and group discussions, but there were more questions about, for example, the lifestyle and experiences of the users. The questions were also more open; for example, users were asked to draw a map of their hike and write anything that came to mind about different sets of pictures.

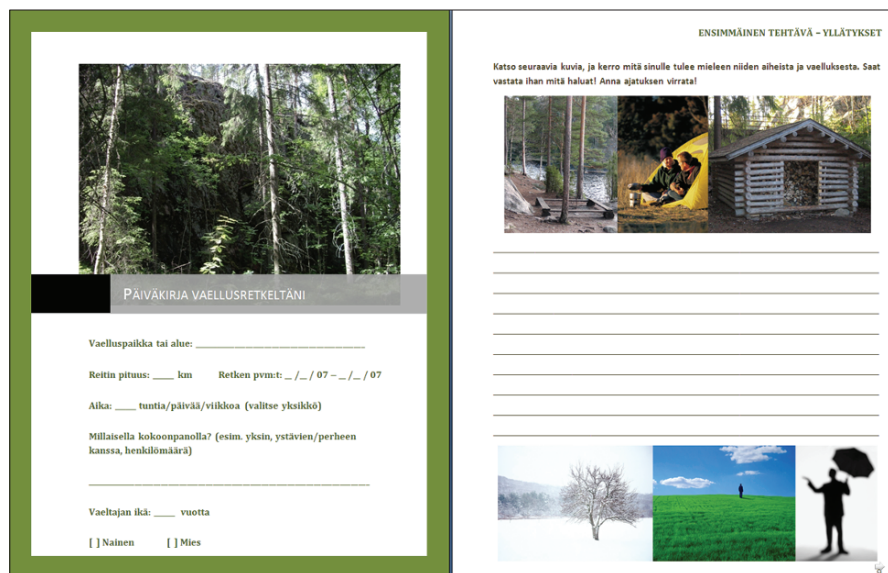


Fig. 11.1. Two sample pages of the probe.

Researchers scrutinized the hiking diaries together with the participants when they were returned.

The empathy probes were delivered to seven persons going for longer hiking trips. The participants were aged 24 to 33 years; four of them were females and three males. The length of their route varied between 8 and 150 km, and the duration of their hike was two to seven days. The hiking areas were located in northern and eastern Finland, and one in Iceland.

11.2.4 Analysis of the Data

The data gathered in the study were analysed in two phases. First, the user requirements were derived separately from the questionnaires, empathy probes, and focus-group discussions with affinity diagrams. In the second phase of the analysis, the identified user requirements were combined and regrouped into thematic entities. This generated a more general understanding of the user requirements for location-based information in the case of hiking and other outdoor activities.

11.2.4.1 Affinity Diagrams

Affinity diagrams are used to organize a large body of data into their natural relationships. According to Beyer and Holtzblatt (1998) the diagrams are suitable especially when analysing verbal data, such as, ideas, opinions or issues, and for dealing with many facts or ideas that seem to be in chaos. The tools used are sticky notes, marker pens and a large work surface. Ideas can be recorded on a separate sticky note or card with a marker pen. The notes are organised into groups of ideas that seem to be related.

In the present study, affinity diagram meetings were arranged with 5 to 6 researchers participating. The data were examined and the answers categorised according to their contents and relationships. As a result, a group of ‘observations’ were established (for example ‘Sharing my location’ and ‘Sharing others’ locations’, as shown in *Figure 11.2*), which each had their own list of remarks or ideas from users (for example ‘could share with people close to me’, ‘would give a feeling of safety’, ‘could share with limitations’, ‘could be useful if I get lost’ and ‘only in an emergency’). From these, individual user requirements were derived (*Figure 11.2*).

11.2.4.2 Synthesis of the User Requirements

A detailed list of altogether 101 individual user needs was gathered as a result of the data analysis. The user requirements were further elaborated into wider thematic categories (*Figure 11.2*, Synthesised user requirement themes). The results of this synthesis are presented and discussed in the following sections.

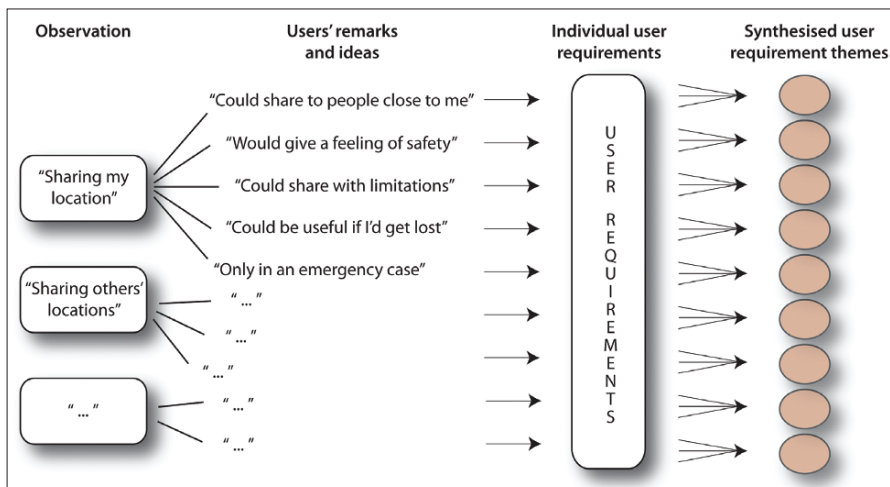


Fig. 11.2. The individual user requirements were established based on the observations from the data. The results were further categorised into synthesised user requirement themes.

11.3 Results

The user requirements resulted in nine thematic categories (Figure 11.3):

- Planning a hike
- Additional information on the area
- 'I am here' services
- Location of other hikers
- Changing conditions
- Emergency situations
- Saving experiences
- Sharing experiences
- Integrated and adaptive services.

The categories partly overlap, also in the sense that the same user needs are related to different phases of the hike (before, during or after). In the following, the main user requirements identified for using location-based information during outdoor activities are presented with clarifying examples from the users. In addition to these nine themes, users' ideas on the properties of their 'dream device' to support hiking are discussed at the end of this section.

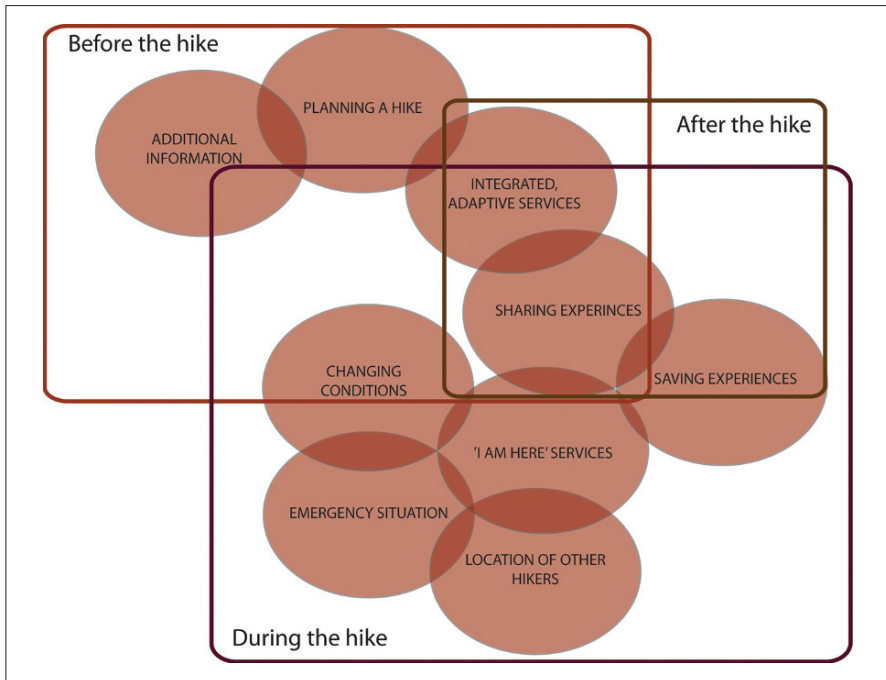


Fig. 11.3. Identified user requirements grouped into 9 thematic categories and their relationship to different phases of the hike (before, during and after).

11.3.1 Planning a Hike

Heterogeneous information was needed for planning a hike or other outdoor activity. No single media, book or other information source provided all the required information, and people gathered information from various services and sources, such as books, maps, Internet pages and magazines. Other people's experiences of the area also played an important role for some people.

When planning a hiking trip, people also needed information on public transport (routes, timetables), local weather forecasts and car parks (location, size, road maintenance during winter). For this, some people used Internet route-planning services, while others used traditional topographical and road maps. Information was also needed on taxi services in the area, in order to return to the car after the hike, or in case of an emergency.

Planning the actual route in the national park was also based on information gathered from different sources, for example, multiple websites, maps, books and phone calls to the national park services. Participants stated that automatic route suggestions based on different criteria would help in the planning as different participants had different preferences for planning the route, such as, 'the shortest',

‘the nicest view’, etc. There was criticism that information about the accessibility of the hiking routes for special user groups (people with disabilities, families with baby carriages) was often not readily available. In some cases, this information was available on information signs in the national park itself, but the problem was that this information is not available when planning the hike. Large overview maps were considered important to allow easy communication between group members in the route planning phase, since the whole group could gather around them. Maps on the small screens of mobile devices were considered insufficient for this purpose.

11.3.2 Additional Information on the Area

As information was gathered from various sources during the planning of a hiking trip, the data gathered were also heterogeneous. For instance, people would have needed maps at different scales: overview maps for general route planning and detailed maps for more detailed topographical information (e.g. locations of wetlands and swamps, rocks, river crossings, rapid categorisation and more accurate contour lines).

More descriptive information on hiking areas was also sought. For example, a map provides only limited information on a camping site, whereas people would often need a better idea of the surrounding views, the size and the facilities of the camping site, etc. Sometimes this type of descriptive information was gathered from others’ experiences of the area. However, there was always the question of the validity of the information, as in the case of hiking reports published on the Internet.

People also needed various thematic information to support their outdoor activities, such as different maps for hiking, cycling and canoeing. These maps should have the information required for the activity in question and for the specific size and form of the hiking group. Furthermore, people are interested in different topics: some wanted information on geology, while others were interested in the history or vegetation of the area. Others were looking for more detailed information on swimming sites, cottages, reindeer fences in Lapland, locations for going ashore while canoeing or access to drinking water.

11.3.3 ‘I Am Here’ Services

There was a recognised need for the ‘I am here’ types of service to support hikers during their trip. Such services were regarded as especially important in cases of emergency or when people are lost. In these situations, suggestions for alternative routes would be of use, and it was considered important for the rescue services to

be able to locate lost or injured hikers easily. Accordingly, it appeared that current GPS devices for navigating were considered mainly as safety equipment for quickly reporting one's location in a possible emergency situation. Today, their value is not in the maps included in the device, as they are often too small and not usually tailored for hiking purposes.

'I am here' services would also be useful for helping people to follow their planned route and for guiding them back to the route, if they happened to veer away from it, either willingly or accidentally. The services would also need to log the hiking route and allow it to be shared with other people. Besides a route displayed on top of a map, an alternative way of showing hikers' routes to other people could be a verbal description of one's location, e.g. 'On top of mountain, -20 degrees Celsius'. For some people, location sharing was related to the enjoyment of sports and competitions, or meeting up with a friend.

11.3.4 Location of Other Hikers

Real-time information about other hikers' locations was occasionally considered necessary – mainly to avoid crowded cottages, tracks and parking sites in national parks. Many people stated that they were unwilling to meet too many other hikers, and the information about other people's locations could be used to avoid them. However, in emergency situations it was considered important to be aware of the location of others for safety reasons.

One of the user requirements for bigger hiking groups was the need to know other hikers' locations when the group was divided into smaller sub-groups. Sometimes members of the hiking group would be hiking in a long line, causing one end of the line to be unsure where the other end was, and the location information of others would be needed for communication.

11.3.5 Changing Conditions

Changes in conditions during an outdoor activity were often considered critical. It was observed that changing weather, light or temperature conditions emphasized the need for real-time location-based information both before and during the hike. Also information on the varying snow depth, rising and setting times of the sun, likelihood of seeing the Northern Lights and the phases of the moon were regarded as important information that could change during the hike. Other factors affecting the hike were movement of other people (e.g. crowded huts), dangerous animals and the conditions of the tracks and facilities in the hiking area. A new route plan might be required if the conditions changed or were not what was expected.

11.3.6 Emergency Situations

One of the most obvious needs for locating one's own or somebody else's position was related to emergency situations. The feeling of safety was considered important, and the knowledge that the emergency services would be able to locate the hiker easily was appreciated. The possibility of getting lost raised the need for supporting services, such as 'I am here' services. Sudden illness, accidents and encounters with wild animals were fears that raised the need for emergency support. One suggestion was a simple emergency button on a mobile phone that would transmit the necessary location information to the emergency services when pressed. Suggestions for alternative routes were also a topic often mentioned: quick and easy routes leading out of the wilderness should be provided on easy-to-read maps.

11.3.7 Saving Experiences

People take photos, write diaries and shoot videos while hiking. However, people would also like to save their experiences in various other ways. One of the wishes was to save personal PoI information, for example reminders of nice views, berry and mushroom picking places, or observations on animals, plants and natural phenomena. This type of information could be saved for the users' own purposes or also made available to other people. The automatic track logging feature of GPS was considered useful as a type of a 'diary'.

Along with technical restrictions, the need to manage the gathered data during and after the hike was considered problematic. The data should be synchronised with a home PC and organised on the fly. People wished to have easier and more automatic ways for saving the combined data, such as, a travel account together with photos and Internet links.

11.3.8 Sharing Experiences

Today, people share their experiences, such as nice views or sightings of birds, berries and geological formations, mostly by photos, videos, multimedia messages and text messages. Methods used more rarely included stories, drawings, poems and people's own music compositions. There was also interest in sharing experiences through mobile blogs, email, voice, web links and services like Google Earth.

The current hiking route, either shown on a map or given as a set of GPS waypoints, was among the most popular things to share. There was a need to share the progress of the hike on a daily basis, too. People also wanted to share their experiences in something like a blog, where photos or voice recordings could be combined with text. However, there is a need to manage the gathered information in a more efficient way to be able to share it easily with others.

The participants were especially willing to share their experiences with family members, friends and other close people. Sharing routes between friends was considered fun and an important way of obtaining tips on where to hike, whereas sharing the current route with family members was considered important mostly for safety reasons. Some people wanted to share their experiences with colleagues and with people sharing the same interests. There was also the need to restrict access to the shared information, as people wanted to share different data with different people.

The ‘push’ or subscription type of information sharing was also seen beneficial. People would like to be able to define the different information categories that interest them and then receive information on that subject, for example when approaching a certain location. People also want to be able to block information or apply some type of filtering to control the amount of information given to them. They also want to restrict the access to information that has been tagged for a specific location.

11.3.9 Integrated and Adaptive Services

A general user requirement related to many stages of the hike was the need to get all the necessary information for the hike from the same service. People also wanted an Internet service for downloading and printing outdoor maps at different scales. In order to satisfy the needs of individual people and their various outdoor activities, tailored maps would be needed for each user and use situation, e.g. detailed route planning, cycling, canoeing or just getting an overview of the area. Special needs for maps to take into account the requirements of special user groups, like families with baby carriage, or athletes, were also mentioned.

Not only should the users be provided with different types of maps for different activities, but the device itself and its user interface should also adapt to the use situation. For example, when skiing in cold weather, the map could be displayed on the surface of the user’s sunglasses, and the user interface could be voice guided, in order to avoid using small device buttons with gloves on. Also, the usage situation of the service should be taken into account. For instance, audio guidance or a touch screen could be possible alternatives for interacting with a service during a hike.

At the same time, it was considered critical that the devices should not distract the user from the hiking experience. People also wanted adaptive services that could filter information based on the user’s situation or preferences. One example was being able to get relevant phone numbers in unexpected situations (local taxi firm, etc.). Better interoperability between services was also considered important.

11.3.10 Dream Devices and Services

It is still a fact today that more reliable network connections, durable batteries and quicker processing capabilities would be needed in order to provide users with devices that they could trust in a hiking situation. The devices should also be resistant to moisture and temperature changes.

Easy-to-use devices were also required since many users suffer from failing eyesight due to their age. The devices should be small and light to carry, but at the same time the display should also be easy to read. A function where the device could project the map onto a suitable surface such as the roof of the tent was suggested. It was also noted that a digital paper map might be useful in the future.

An ‘all-in-one’ device, which would include functionalities such as a step-counter, compass, camera, GPS and mobile phone was on the wish list. A barometer, altitude meter, thermometer and radio were also regarded as being important.

Technological assistance was criticised by some participants who wanted to stay away from technical devices while visiting nature. Some respondents noted that it is part of the fun to use the paper maps during the hike-planning phase so that everyone can see the map all at the same time and point to different locations on a map and to get an overview of the area. Accordingly, collaborative map use should be supported with the maps on computer screens, too.

11.4 Discussion

The present research aimed to study how location-based information could be beneficial, especially to the hikers in rural areas. There seems to be a need for LBS that would be able to support hikers’ various needs and tasks. Some of the user requirements identified in the study may seem already well known. The question is why do not the available services and devices already answer to these requirements of the users? Is it because of the lack of the technologies to provide these?

The next step after identifying the user requirements would usually be to design and implement LBS that would answer to the identified detailed user requirements. Since this was not the focus of this paper, a follow-up study would be needed, to be able to differentiate between different types of users, tasks and use situations in order to develop LBS that could answer to the identified adaptivity requirements etc.

In addition to general LBS user requirements, two research questions were specifically studied: the changes occurring during the hike, and the community and content needs of hikers. Changes in the hiking conditions and how to deal with them can be critical to the success of the hike. Sudden changes are often hard to predict, and in such situations people often need new information that they have not been able to obtain beforehand. To cope with the changes, people sometimes need to

contact some external party for help or to make new arrangements, such as alternative transportation or accommodation. Sometimes it is a question of survival, but more frequently the changes just make things less easy or unpleasant. Accordingly, a good LBS should know what situations hikers might encounter and how they could be best supported to deal with the possible changes.

The most important user requirements in relation to the unexpected situations were assistance in planning a new route and general support for leaving the hiking area. In practice, this would mean new route descriptions, public transport timetables and contact details for the relevant services. Another important requirement was related to emergency situations, in which an easy and reliable system would be needed to deliver an emergency message to the rescue services. This was a more general problem of today – users require more reliable devices and services. Due to their technical shortcomings (e.g. short battery life, no resistance to water), the devices that are currently available are mainly carried as safety equipment.

By realising how critical the changing conditions are for the hike, an important user requirement was identified: the need for real-time and up-to-date information. First, in the planning phase of the hike, people wanted information on local weather forecasts, snow depth for skiing and river water levels for canoeing. Up-to-date information was also needed on the condition of huts and different tracks in the national parks, since the information currently available was not always to be trusted. People reported incidents where huts were uninhabitable, tracks had been changed or maps were not up-to-date. Webcams were proposed as a possible solution for the need for real-time information on whether the huts were currently occupied and how busy the tracks were.

The second central theme emphasised in this study was based on the observed trend that people are already saving and sharing their location information, photographs, etc. by using mobile devices. Some hikers found it important to share their own experiences and information related to their hike not only among close people but also among ‘like-minded’ people, mostly in the form of photos posted on the Internet. Besides having fun, reasons to share were also practical, such as sharing information on available facilities like access to drinking water or toilets. Also, GPS-based routes were saved and shared with others in order to report the progress of the hike.

Community needs may also become important in this domain, especially due to the different communities that form on the Internet nowadays and the social networking that they facilitate. The community needs of hikers were related to all the three phases of the hike. When planning a hike, information on other hiker’s routes and experiences in the area was considered important. During a hike, the community needs were related to the communication between the sub-groups and knowing the locations of other hikers, either to avoid strangers or to keep in contact with friends. After the hike, the community needs were related to sharing the experiences.

11.5 Summary

Future LBS may have an important role in supporting leisure activities and providing services specific to the current location. The aim of this study was to define user requirements regarding the location-based information of hikers and people carrying out similar outdoor activities. Empirical usability-engineering methods, questionnaires, empathy probes and focus-group discussions, were used to gather qualitative information about potential users and their tasks.

As a result of the study, approximately 100 specific user requirements for future LBS were identified. These requirements were grouped into nine main categories that were identified as important from the users' viewpoint: planning a hike, additional information on the area, 'I am here' services, location of other hikers, changing conditions, emergency situations, saving experiences, sharing experiences, and integrated and adaptive services. Some issues were more important when planning the hike, some during the actual hike and navigation, and others after the hike when saving and sharing one's experiences with others in various ways.

People often choose the places they want to visit based on the available facilities and services. This research highlighted the current needs of hikers, and through that information, what type of services should be developed to attract more people to national parks. This paper discussed each of the user requirement themes to outline the critical requirements for the future LBS from the viewpoint of a hiking user. By designing devices and services that meet the identified user requirements, new 'killer' applications for outdoor leisure activities could become a reality with LBS.

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