

# User needs for personal navigation services – group discussions and diaries



## DELIVERABLE 3

### Version 1.1

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Last modified on 30.08.02

## Version history

Version	Date	Author(s)	Description
0.1	05.04.2002	Anttila, Rathmayer, Hyppönen	First draft to be commented by experts
0.2	24.04.2002	Anttila, Rathmayer, Hyppönen, Mankkinen	Second draft to be commented by steering group
1.0	05.05.2002	Anttila, Rathmayer, Hyppönen, Mankkinen	Language check by Richard Walker
1.1	01.07.2002	Anttila, Rathmayer, Hyppönen, Mankkinen	NAVI logo and Finnish abstract

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## Summary

The results suggest that the most common and frequent situations in users' everyday life are related to daily travelling. People indicated this information to be important and were quite positive about personalised, real-time traffic information. This information was needed by most of the users daily. The most important information need when travelling daily trips by car was

- real-time information about incidents, events and accidents affecting the route selection and travel duration,
- re-routing the itinerary while driving (based on dynamic traffic information),
- information about parking spaces,
- guidance in unfamiliar environment and
- information about road conditions during wintertime

Real-time information about congestion (or traffic density), route optimisation based on real-time traffic information and estimated real-time travel duration were indicated to be the most often used information.

When travelling daily by public transport, the most important information needs were

- real-time stop time,
- paper time schedules and
- estimated stop times (departing, arriving)

Real-time destination stop time (forecast) was indicated more often to be one of the most important information need. According to the participants, the most frequently used information would be estimated stop times, real-time stop times (start and destination stops) and paper time schedules. Also information about incidents was seen as important, but would probably be relevant less frequently than daily.

The most important information for critical users travelling by public transport were mostly related to their possibility to use the public transportation system. In addition to the basic information mentioned above, they indicated that important information related to travelling with public transport would be

- the real-time information about unobstructed route to the stop, inside the vehicle and to the final destination to be the most critical information (especially physically disabled users)
- guidance to the stop and guidance to get off at the correct stop were indicated to be important (especially visually impaired users).

The critical user groups pointed out that critical users often need similar information to all other users. In addition to this typical information, they often need more detailed information about the environment (walking to the stop, the stop and the vehicle). More detailed results of users needs of different users are presented in Table 6 (page 23).

The most important information need when taking longer trips by car was

- guidance in an unfamiliar city,
- car navigation,
- guidance if a detour is required,
- information about accidents and congestion

According to participants, the most frequently used information would be estimation of total travel duration.

Naturally, planning seemed to play a much more important role when travelling longer trips with public transport. The most important information was information about possible modes, routes and time schedules. Also information about prices, the most suitable mode and route as well as travel duration (estimation) were selected more often to be one of the three most important information needs. According to the participants, the most frequently used information would be estimation about total travel duration.

Other frequent situations in everyday life were related to shopping (especially daily groceries) or weather. Information needs while shopping varied depending on the situation: daily shopping was supposed to be efficient (products needed, shops on daily route etc.) whereas information needs when looking for specific product were different (finding the product, comparing prices etc.). Inside the shop, the information needs were related to finding the product and getting additional information about selected product. Information about weather and road conditions was needed quite often and in different situations. Information needs were related either to current weather at a specific place, weather forecast for the next day or possible changes in weather conditions during the day. Information needs related to the “slipperiness and road or surface conditions” theme were related to slipperiness of the selected route or condition of ski tracks or skating rink.

Guidance information in an unfamiliar city was indicated to be the most valued information in the phone interview study that was conducted in part 1 (over 70% of the Finnish respondents were willing to pay for this information). Therefore detailed information about the content of the guidance service was collected in the group meetings. Information needs when travelling in an unfamiliar city were related to

- different areas of the city,
- attractions, points-of-interest (POI),
- events,
- services (restaurants etc.),
- different tours and
- travelling by public transport or by taxi.

When discussing possible service solutions for guidance in an unfamiliar city, one proposal was an electronic map including information about street names, buildings, attractions and points-of-interest, where the real-time information about users' location would be shown as a red dot.

Most of the participants were not familiar with location-based technology and did not have clear ideas of the different possibilities of location-based services. Therefore it was somewhat difficult for them to imagine possible services and even more difficult to forecast their willingness to pay or frequency of using these kinds of services. Spontaneous service ideas related to locating people were mainly related to special groups or special situations such as prisoners when moving outside the prison, elderly people or demented patients or people who may be in danger (getting lost, accident etc.). However, locating children, friends or spouse in situations where the person concerned has consented to being located (shopping, exhibitions, crowded event or place etc.) was seen as being useful by some of the participants.

Service ideas locating other moving objects were related to

- locating the users' own vehicle (stolen vehicle or forgetting the exact location of the parking space),
- locating public transport vehicles (real-time information to travellers),
- locating animals (hunting dogs etc.) or

- locating participants' smaller items such as a mobile phone, bike or keys.

Services ideas where the location of users is used in order to find the nearest service or location-based information were related to finding the location of restaurants, cash machines, civil service departments, beaches etc. Additional information about the selected services (services' business hours, prices, special offers etc.) was seen as being useful as well. Other possible service ideas were using user location when ordering a taxi and the saving and possible sending of the location information to someone else (location of mushrooms, berries, special birds etc.). Overall, the participants did not seem to have a clear idea of how these services might ease their everyday life. Therefore the services should have quite clear idea of usage and benefit of using the service, since the users, at least in the early phase of personal navigation, are not very innovative users creating new possibilities to use the old services in other situations. Most of the users might not even be aware of possible exploitation of new location technology in order to enhance their every day life. In addition, more research is needed to find out whether the possible everyday solutions (locating children, friends or spouse in situations where the person concerned has consented to being located) would be used, and in which kind of situations.

When asking the participants about the most important attribute (of selected four), the possible environment where the navigation device could be used (only indoors, only outdoors, both indoors and outdoors) was stated to be the most important. This is quite natural, since this is the only characteristic that limits the use of a navigation service. The second most important characteristic was the relationship with mobile phones: participants indicated quite clearly that a navigation device that would be integrated with a mobile phone would be most attractive and with a separate device least attractive. However, one needs to keep in mind that these are results of a quite limited conjoint analysis (48 participants) and more mock-up-based research is needed to be able to define the importance of different characteristics in personal navigation devices more thoroughly.



## Tiivistelmä

Tämä tutkimus on osa NAVI-ohjelman horisontaalista tukihanketta ”Liikkuvan käyttäjän tietotarpeet” (NAVITarve). Hankkeen tavoitteena on laajamittaisesti kerätä ja analysoida henkilökohtaisen navigointiin liittyviä käyttäjätarpeita, odotuksia ja epäilyjä sekä mahdollisia potentiaalisia käyttäjäryhmiä. Tutkimus koostuu kolmesta erillisestä osasta, jotka raportoidaan erikseen. Tämän, hankkeen kolmannen osan päätavoitteina on tutkia yksityiskohtaisemmin tiettyjen käyttäjäryhmien käyttäjätarpeita ja tilannesidonnaisia tietotarpeita. Käyttäjäryhmät ja käyttötilanteet valittiin laajassa puhelinhaastattelussa (tutkimuksen ensimmäinen osa, D1) esille nousseiden tärkeimpien tietosisältöjen ja potentiaalisten henkilökohtaisen navigoinnin käyttäjäryhmien perusteella. Lisäksi tarkasteltiin erilaisten käyttäjien päivittäisiä tietotarpeita laajemmin rajaamatta niitä tarkemmin liikkumiseen liittyviin tietotarpeisiin (henkilökohtaiset päiväkirjat).

Tulokset osoittivat, että yleisimmät (useimmiten toistuvat) tilanteet jokapäiväisessä elämässä liittyvät usein liikkumiseen. Päivittäiseen liikkumiseen liittyviä tietotarpeita pidettiin tarpeellisina ja vastaajat suhtautuivat myönteisesti personoituihin, ajantasaisiin tietopalveluihin. Tärkeimmiksi tietosisällöiksi autolla liikuttaessa (päivittäiset, lyhyet matkat) nimettiin

- ajantasainen tieto liikenteen häiriötilanteista (esim. onnettomuudet), jotka vaikuttavat henkilön matka-aikaan ja mahdolliseen reittivalintaan,
- ajantasaiseen liikennetietoon perustuva reitinoptimointi (ajantasaisen liikennetilanteen huomioon ottava uudelleenreititys),
- ajantasainen tieto vapaista parkkipaikoista (sijainti, hinta jne.),
- opastus (ajoneuvonavigointi) vieraassa ympäristössä ja
- sää- ja kelitiedot talvikaudella.

Ajantasainen tieto ruuhkista (tai liikennemääristä), ajantasainen reitinoptimointi ja arvioitu matka-aika olivat tietopalvelut, joita vastaajat arvelivat käyttävänsä useimmiten.

Vastaavasti matkustettaessa päivittäisiä matkoja joukkoliikennevälineillä vastaajat nimesivät tärkeimmiksi tietosisällöiksi

- ajantasaisen (ajoneuvokohtaisen) pysäkkiajan,
- paperiset joukkoliikenteen aikataulut ja
- ajantasaisen matka-ajan (arvioitu perille saapumisaika).

Ajantasainen pysäkkiaika nimettiin selkeästi tärkeimmäksi tietosisällöksi. Ajantasaisen pysäkkiajan lisäksi vastaajat arvelivat käyttävänsä useimmiten pysäkkiaikataulua (arvioitu pysäkkiaika) ja paperista aikataulua. Lisäksi tietoa poikkeusaikatauluista (tapah-tuma, onnettomuus, tekniset ongelmat) pidettiin tärkeänä, mutta harvemmin tarvittavana tietosisältönä. Ns. kriittiset käyttäjät (erityisryhmät) nimesivät joukkoliikennevälineillä liikkumiseen liittyvistä tietosisällöistä tärkeimmiksi sellaiset palvelut, joiden avulla he voisivat valita itselleen mahdollisimman esteettömän reitin ja kulkuvälineen (matalalattia-kulkuvälineet, portaat jne.). Edellä mainittujen perustietojen (aikataulut, pysäkkiaika jne.) lisäksi erityisen tärkeinä pidettiin ajantasaista tietoa koko reitin (matka pysäkillä, pysäkillä, ajoneuvossa) esteettömydestä (keli, tietyöt jne.) ja opastusta oikealla pysäkillä.

Matkustettaessa pidempiä matkoja autolla tärkeimmiksi tietosisällöiksi nimettiin

- opastus vieraassa kaupungissa ja matkalla sinne (ajoneuvonavigointi),

- opastus tarvittaessa kiertotietä (onnettomuus, ruuhka tms.) ja
- ajantasainen tieto onnettomuuksista ja ruuhkista

Vastaajien mukaan kuitenkin useimmiten käytetty tietopalvelu oli arvioitu (ajantasaisen liikennetiedon huomioon ottava) matka-aikaennuste.

Matkustettaessa pidempiä matkoja joukkoliikennevälineillä matkan suunnittelu ja suunnitteluvaiheessa tarvittavat tietotarpeet korostuivat autolla liikkumiseen ja päivittäisiin matkoihin verrattuna. Tärkeimmäksi tietosisällöksi nimettiin tieto siitä, mitkä ovat mahdolliset vaihtoehdot (kulkumuoto, reitti ja aikataulut) määränpäähän tietynä ajankohtana matkustettaessa. Lisäksi tiedot eri vaihtoehtojen hinnoista ja matka-ajoista nimettiin kolmen tärkeimmän tietosisällön joukkoon. Vastaajat arvelivat reittioptimoinnin lisäksi käyttävänsä useimmiten palvelua, joka arvioisi ja päivittäisi ajantasaisesti kokonaismatka-ajan ovelta ovelle.

Liikkumiseen liittyvien tietotarpeiden lisäksi päiväkirjaosuudessa (arjen tilanteiden ja tietotarpeiden vapaa kirjaaminen) usein esille nousseita teemoja olivat ostoksilla tarvittavat tietosisällöt (erityiset päivittäisostokset) sekä säähän ja keliin liittyvät kysymykset. Ostoksilla vastaajien tietotarpeet jakautuivat melko selvästi erilaisiin kysymyksiin ostotilanteesta (päivittäistavarat vrt. tietyn erikoistuotteen osto) ja ostovaiheesta (suunnittelu, kaupan valinta, kaupassa) riippuen. Päivittäiset tavarat haluttiin löytää mahdollisimman tehokkaasti (nopeasti, reitin varrella jne.), kun taas etsittäessä tiettyä tuotetta haluttiin tietää, missä kaupoiissa tuote on saatavilla ja vertailla hintoja. Kaupassa sisällä tietotarpeet liittyivät tiettyyn tuotteeseen, joko sen löytämiseen kaupan sisältä tai tarkempiin tuote-kohtaisiin tietoihin kuten hintaan, hoito-ohjeisiin jne. Säähän ja keliin liittyvät tietotarpeet tulivat esille hyvin monenlaisissa arjen tilanteissa. Tietoja kaivattiin esimerkiksi liittyen säähän tai sääennusteeseen jossain tiettyssä paikassa tai sään muutoksista tiedottaminen (sade, liukkaus ajaessa jne.). Keliin liittyviä tietoja tarvittiin yleensä automatkaa suunniteltaessa tai automatkalla, mutta myös kävelylle, hiihtämään (voitelu) tai luistelemaan lähdetäessä.

Vieraassa kaupungissa opastus nimettiin tutkimuksen ensimmäisessä osassa (laaja puhe-  
linhaastattelu) yhdeksi potentiaalisemmaksi paikannuspalveluksi (yli 70 % suomalaisista oli valmis maksamaan palvelusta). Tämän takia ryhmäkeskusteluissa keskityttiin mm. kyseisen tietopalvelun tarkemman tietosisällön määrittelyyn. Tärkeimmiksi vieraassa kaupungissa opastuksen tietosisällöiksi nimettiin mm.

- kaupungin eri alueiden kuvailu
- nähtävyydet (POI)
- tapahtumat ja niiden sijainti
- palvelut (ravintolat jne.)
- mahdolliset nähtävyydskierrokset
- mahdollisuudet matkustaa joukkoliikennevälineillä tai taksilla (luotettavuus, yhteydet, aikataulut, hinnat).

Keskusteltaessa mahdollisista opastuspalvelun toteutustavoista, yksi ehdotus oli elektroninen kartta (graafinen näyttö tms.) kaduista, tärkeimmistä rakennuksista ja muista juuri käyttäjän valitsemista tiedoista (nähtävyydet, joukkoliikennereitit), jossa käyttäjän reaaliaikainen sijainti olisi esitetty punaisella ympyrällä.

Tutkimuksen kolmannessa osassa tehtiin ryhmäkeskusteluiden lopussa vertaileva conjoint-analyysi siitä, mitkä ominaisuudet (valituista neljästä) vaikuttaisivat eniten henkilökohtaisen navigointilaitteen haluttavuuteen (ostopäätös). Tärkeimmäksi tekijäksi nimettiin

navigointilaitteen ja –palveluiden käyttömahdollisuus sekä ulkona että sisällä. Tämä oli melko oletettua, sillä tämä oli valituista ominaisuuksista ainoa, joka rajoitti palveluiden käyttöä tiettyyn tilaan. Toiseksi tärkeimmäksi ominaisuudeksi nimettiin henkilökohtaisen navigointilaitteen integrointi matkapuhelimen kanssa. Haluttavin oli vaihtoehto, jossa matkapuhelin ja navigointilaite olivat yksi laite. Tuloksia tarkasteltaessa tulee kuitenkin muistaa, että analyysi tehtiin rajoitettuna, 48 vastaajan analyysinä, joten tuloksia voidaan pitää vain suuntaa antavina.

Tutkimuksen ryhmäkeskusteluissa huomattiin, että tavalliset käyttäjät tunsivat paikannustekniikan antamia mahdollisuuksia melko huonosti ja heidän oli melko vaikeaa miettiä heille selitetyn teknologian mahdollista hyötykäyttöä omassa arkielämässään. Usein spontaanisti listatut palveluideat oli suunniteltu erityisryhmien kuten vankien, vanhusten tai dementoituneiden henkilöiden käyttöön. Lisäksi palveluideat liittyivät henkilön paikannukseen hyvin harvoin tapahtuvissa erityistilanteissa kuten eksyttäessä. Suuremmalle käyttäjäryhmälle suunniteltuja palveluideoita olivat mm. lasten, ystävien tai puolison sijainnin kysyminen (paikannettavan henkilön lupa) esimerkiksi suurissa tilaisuuksissa tai ostoksilla oltaessa. Henkilöiden paikantamisen ohella keskusteltiin mahdollisista palveluideoista, jotka hyödynsivät esineiden paikantamista. Tällaisia palveluideoita olivat mm. oman ajoneuvon paikantaminen (varkaus tai takaisin parkkipaikalle löytäminen), joukko-liikennevälineen paikantaminen reaaliaikaisen pysäkkiajan ennustamiseksi, kadonneiden eläinten paikantaminen ja varastetun tai kadotetun polkupyörän, matkapuhelimen tai avainten paikantaminen. Tilanteita, joissa nimettiin hyödylliseksi lähimmän paikan löytäminen käyttäjän sijainnin avulla olivat mm. lähimmän ravintolan tai rahannostoautomaatin sekä tietyn viraston löytäminen. Etsityn palvelun tai rakennuksen sijainnin lisäksi käyttäjät mainitsivat usein haluavansa kohteesta lisätietoja kuten aukioloaikoja, annosten hintatasoa ja erikoistarjouksia. Oma sijaintia arveltiin voitavan käyttää myös taksin tilaamisessa tai hyvän marja- tai kalapaikan merkitsemisessä.

Vaikka keskusteluissa nimettiinkin joitain palveluideoita, ideoiden soveltaminen arjen tilanteissa ja mahdollisesti niistä saatavat hyödyt tuntuivat olevan osallistujille vielä epäselviä. Palveluja markkinoitaessa olisin hyvä osoittaa potentiaalisille käyttäjäjoukolle mahdollisimman konkreettisesti tilanteet, joihin palvelu sopii ja hyödyt, jotka se mahdollistaa. Etenkin uuden teknologian kohdalla tavallisten käyttäjien saattaa olla vaikea oma-toimisesti keksiä mahdollisia sovelluskohteita heidän jokapäiväisessä elämässään. Markkinoinnin kannalta saattaakin olla tehokkaampaa keskittyä potentiaalisten käyttäjäryhmien ongelmien kartoittamiseen ja palveluiden suunnitteluun ja markkinointiin ongelmalähtöisesti. Palveluiden suunnittelun yhteydessä tulisi lisäksi keskittyä tutkimaan tarkemmin millaisilla palveluilla on sosiaalinen tilaus ja hyväksyntä sekä sitä, millaisissa todellisissa tilanteissa palvelua eniten käytettäisiin.



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1.1

APPENDICES

# 1 Introduction

Anticipation and assessment of user needs are essential in the development of all new technology. The better this succeeds the larger the market the company can anticipate for its products. For new technology, which can be used to access public services, it is even more important that services meets the needs of different users, since public services are required to be provided equally to all citizens.

The user needs study (NAVITarve) is part of the NAVI program. It aims to provide authorities, content providers and device manufacturers with relevant information regarding user needs for personal navigation, related doubts and expectations, and potential market segments that could be explored. The study consists of three parts that are reported separately:

1. Phone interviews with a representative sample of people from Finland (report D1)
2. Phone interviews with a smaller representative sample from two European countries (report D2)
3. Personal diaries and focus groups in Finland (report D3)

The main object of the first part (phone interviews in Finland) was to investigate with a representative sample of the Finnish population the overall user needs for personal navigation services in Finland. The respondents were asked to indicate the importance and willingness to pay for 23 listed information contents, mainly information that is needed when travelling. In addition, the importance and the respondents' willingness to pay for non-existing information that might be enabled by new location technology was asked from respondents. Results from this section provided information at a general level about the information needs and opinions of people in Finland. The results suggest that there is a significant number of people who are interested and willing to pay for personalised, real-time information that is provided to their own portable device. Especially information related to everyday travelling, but also location-based services (particularly guidance) were indicated to be important. However, because of the large sample size and selected method (phone interview), the results are at a very general level and only the importance of listed information was studied.

The third part, which is reported in this report, was designed to partly supplement the problems mentioned with the results from part 1. More detailed, the main objectives of this third part of the study were as follows:

- To investigate more in detail the information needs of different users (critical users, lead users, typical users) in different travelling situations (travelling by car, public transport etc.)
- To explore the problems and information needs of users in different events of everyday life not just limited to travelling situation (shopping, free-time activities etc.)

The more detailed information content requires qualitative methods (diaries, group meetings, scenario work, observation etc.) and interaction with informants. In the third part of the study, both personal diaries and group meetings were used in order to specify the content of information that were indicated to be important in the part 1 interviews. In addition, qualitative methods enabled the collection of more detailed information about the information needs of different users (lead users, typical users, critical users) in these potential situations. The third part of the study is reported below and the other two parts are reported separately: phone interviews in Finland in deliverable 1 (Anttila et. al., 2001) and phone interviews in Italy and Germany in deliverable 2 (Anttila, 2002).

## 2 Research approaches

### 2.1 Methods in qualitative research

#### Diaries

The diary method is often used if the events of interest are too rare, private or geographically dispersed for direct observation. Another advantage compared to the focus or discussion group method is that in the diary method the participants report their information needs right after they have occurred. It is known that in everyday life situations, users too easily forget important details of their behaviour if they are reporting them long after the event. (Colbert, 2001). The diary method also often generates qualitative data about the nature of information needs in every-day-life. The diary method has been used to study for example the potential applications of future media capture technology (Brown et al., 2000) and is generally useful in user-centred product development (Rieman, 1993).

#### Group discussions

Group discussions help to summarise the ideas and information that a group of informants may come to hold as a group. The general idea is that each participant can act to stimulate ideas from the other people present, and that by a process of discussion the collective view becomes greater than the sum of the individual parts. Group discussion can be used to serve a variety of purposes, but mainly it is used to assist in problem identification, in clarifying the issues relevant to a particular topic, and in the evaluation of products. Group discussions are very commonly used in the “user requirement” and “user needs” stages of product development. (HUSAT, 1999).

Group discussions are commonly arranged to last for two to three hours. There are no specific requirements for the participants, apart from them having some knowledge of the area under discussion. For complex issues it can be useful to have discussion groups that are multidisciplinary so that different perspectives and viewpoints can be aired, whilst for other purposes, relatively homogenous groups might be preferred. Discussion groups can be run with large numbers but to be effective, it is better to have small groups. Experience shows that between six and eight participants is easy for a single facilitator to manage. It is also fairly common to include a short questionnaire(s) after the group discussion. This can include background information on the participants, perhaps also asking them to summarise their opinion on the issues raised during the discussion. This can be a useful supplement to the issues raised in the discussion. (HUSAT, 1999).

Very often, it is the users that are the most relevant participants in discussion groups, as they are the experts in dealing with the selected issue (driving by car, travelling by public transport etc.). With a qualitative method such as discussion groups, it is impossible to get a “representative sample”. Therefore it is important to have some “typical users”, but also people who represent “the extremes of a user group population” in the groups. Therefore when the group members are selected, their background (gender, age, life situation etc.) should vary in order to get an overview of the opinions. However, one needs to keep in mind that it is not the purpose of qualitative method to be confident that groups’ opinions are representative of the wider population. Therefore other methods are recommended to supplement the information gained in these group discussions. (HUSAT, 1999).

## Brainstorming

Brainstorming is usually applied in the very early stages of design, often in the problem and user need definition. Brainstorming is one of the several techniques to facilitate group creativity and is one of the oldest and best known. Brainstorming is an essentially creative exercise, where groups of participants are brought together to explore a common issue and look for possible solutions. The idea of a brainstorming is that each participant is allowed to be creative in his or her ideas. Brainstorming is used to generate new ideas by freeing the mind to accept any idea that is suggested, allowing freedom and creativity. The result of a brainstorming session is hopefully a couple of good ideas, and a general feel for the solution area. (HUSAT, 1999).

The starting point of a brainstorming session is defining the problem or presenting a new technical possibility. The next step is to let all participants tell (list) their ideas of possible solutions or applications for the technical possibility presented. The particular feature of the brainstorming technique is that each participant's "own list of solutions and applications" continues to grow after the presentation of other participants' ideas. Each time a new idea is presented, the other group members are encouraged to use it as a stimulus for new ideas. Participants can build on others ideas, try to take them further, try to think of similar or quite opposite ideas. The data from a brainstorming session is "the total pool of ideas" generated during the session. To analyse the data further, ideas can be grouped in some natural groups by the group or the group leader. (HUSAT, 1999).

## Conjoint analysis

Conjoint analysis is a multivariate technique used specifically to understand how respondents develop preferences for products or services. It is based on the simple premise that consumers evaluate the value of product/service/idea (real or hypothetical) by combining the separate amounts of value provided by each attribute. Utility, which is the conceptual basis for measuring value in conjoint analysis, is a subjective judgement of preference unique to each individual. It encompasses all products or service features, both tangible and intangible, and as such is a measure of overall preference. In conjoint analysis, utility is assumed to be based on the value placed on each of the levels of the attributes and expressed in a relationship reflecting the manner in which the utility is formulated for any combination of attributes. For example, we might sum the utility values associated with each feature of a product or service to arrive at an overall utility. Then we would assume that products or services with higher utility values are more preferred and have a better chance of choice (Hair et. al., 1998).

There are some basic **advantages** of the conjoint analysis approach in relation to comparable traditional methods in which individuals are asked to judge attributes separately, including:

- a coherent view on evaluation of alternatives and decision making is provided;
- this approach has proved to perform well in terms of predicting preference and choice behaviour in marketing and service industries;
- a well-developed set of research tools is available for the operationalisation

Next to these advantages, some **limitations** of conjoint analysis should be taken into account. There exists some uncertainty about the relationship between preferences and choices made by individuals in experiences and their real-world preference and choice behaviour. Although research has been conducted to overcome these pitfalls (e.g. Timmermans, 1984), attention should be paid to these notions. Another disadvantage is that so far, to our knowledge, the approach has mostly been applied in the context of preferences and choices regarding well-known products and services among the individuals questioned. In our research however, it is unlikely that individuals will be very familiar with the systems in question, due to the innovative character of personal navigation devices. Hence, it is uncertain whether individuals will be able to understand and evaluate the systems properly. In particular the theoretical founda-

tions, advanced error theory and flexibility for developing and using advanced research tools make a conjoint approach highly attractive (Molin, 1999).

## **2.2 Design for all – expanding the market?**

### **2.2.1 Potential customers - “target users” or “critical users”?**

With modern technology, it is increasingly difficult to forecast who is going to use it, where and for what purpose. New technologies spread fast and are rooted as tools in tasks for users, for whom they were not originally designed. No area of our everyday lives remains untouched by new technologies.

How can companies anticipate this? How can they design new technologies for use and users they don't know? And more importantly, why should they? The last question is easy to answer: according to the MIT professors, one of the key factors of successful technology development is the ability to anticipate the needs of the potential customers, and the ability to quickly and cost-effectively develop technology to meet those needs. (Ulrich, 1995)

But how can this be done, if the potential customers could be anybody who might find a particular technology useful and is willing to spend the money? The technology could even be financed as an aid by the social and health care system or insurance company for those who need it but cannot afford it, to ensure their independence and avoid the alternative service costs. Service costs are becoming increasingly important, since life in an information society without having access to the appropriate technology to use the services is becoming increasingly disabling.

Helping people to maintain their independence and autonomy (the ability to help themselves) in the information society is one of the central goals of social and health care policies in Finland (STM, 1999) and the EU (Porrero, 1998). One reason for supporting people's independence is to keep the public service costs from rising sky high in ageing societies. This will not happen by creating disabling technologies for mass markets. It will also not happen by creating parallel, extremely expensive assistive technology versions for those who cannot use mass-market products designed for the likes of the designer. It will only happen if mass-market technology producers realise that the users come in all sizes, shapes and colours.

Potential customers are everywhere. That is, if modern technologies were designed to accommodate for different users and use situations. In most cases still today, they aren't. This is a sure way to lose up to 25% of the potential market. The ageing of the population is predicted to result in a situation where in 2030, 25% of the population will be over 65. None of us at that age escape from suffering some changes in our functional abilities: in our eyesight, in hearing, in co-ordination and in memory. It can be said that technology is designed according to anthropometric tables: to accommodate for 95% of the population's visual acuity, 95% of typing speed etc. But any real consumer is a SUM of these and hundreds of other abilities. If one ability falls within the 95%, many other may not. In addition, these abilities are measured in laboratory environments and do not apply in dark, wet, cold, noisy, busy, multitask situations of use. In the end, a product that was aimed at 95% of the population may only suit 50% of the intended target market. (Hyppönen, 2000A).

### **2.2.2 Involving critical users – a way to expand target markets**

Traditionally, product design has focused on technical features and functions, in the belief that the users will adapt to the requirements of technology. During the past decades, innovation

and economic science literature as sociology of technology has increasingly stressed co-operation of users and producers as a central element in ensuring the success of innovations (Lundvall, 1992), (Victor, 1998), (Latour, 1987). User-centred or participatory and contextual design approaches have been developed in order to meet the challenge. Erich von Hippel developed a lead user method to ensure the transfer of user needs to technical innovations (Hippel, 1988). Usability research, user-centred and contextual design methodologies have also developed a variety of methods to ensure that the needs of intended customers can be met cost-effectively.

However, one important question these methods do not give an answer to is who should be selected to participate in the design in order to create technology for as wide an audience and use situations as possible. Von Hippel says it is the 'lead users'. But aren't they closer to the designer than other consumers? How can they tell what a 65-plus lady lost in a foreign city on a cold, dark winter evening will require? For an answer to this question, we need to look at a design approach that has been developed in the USA and Europe since the 1970's: Universal, Inclusive, Barrier Free, Accessible Design or Design for All. None of these terms do justice to the approach, which recognises that nothing is ever designed for ALL people. The key idea of the approach is that if you select 'critical users' (in addition to 'lead users') to participate in the design, you will be able to create technology that will serve well most of the intended users, whoever they might be, also in 'critical' situations of use. Why? Because 'critical users' encounter every day in every encounter with modern technology similar problems that 'average' or 'lead users' encounter in 'critical' or disabling situations, such as loud, cold, dark environment, multitasking, stressful situations of use etc. (Hyppönen, 2000B).

This was done in this NaviTarve study in group meetings. In addition to markets, defined "target users" information was collected from three groups of users, which were identified as 'critical' potential users of personal navigation services. These were people with visual, mobility and memory disabilities. These three groups of 'critical' users shed valuable light on 'critical' situations of use, which every potential user is bound to encounter at least occasionally in familiar and more often in unfamiliar environments of use. For visually as well as memory impaired people, every trip outside their own home is a trip into the unknown, through which accurate, up-to-date information can guide them. For mobility impaired people, every trip outside their home is full of physical (and social) barriers, very similar to the ones anybody who has tried to move about with a pram, pushing a bicycle or carrying heavy luggage would have experienced. The anticipation of the problems by this group of people often results in their abandoning the idea of the trip altogether.

The result show once again how similar the information needs of these groups of users are to the needs of everybody else – approximately 50% of those information needs expressed by critical user were same as those information needs expressed by typical users. Twelve of all listed information needs was expressed by critical users, but not by typical users. Looking at these information needs more closely reveals, that majority of these information needs can be seen to facilitate travelling for anybody in less than ideal situation – unfamiliar environments, travelling with luggage, pram etc. Vice versa, only six listed information needs (out of 35) were expressed only by typical users, but not by critical users.

## 3 Methods

### 3.1 Selecting methods and respondents

In this study, mainly two methods were used in data collection: personal diaries and group meetings. In addition, a limited (48 respondents) conjoint analysis was carried out in order to gather information about the importance of different device characteristics. A two-day diary was used as an approach to collect data about the information needs of different people in different events and situations in their everyday life. This approach was chosen to collect a large variability of everyday situations and the information needs related to them. Group meetings were used in order to collect situation-based, more general information (relevant to larger group of users) about user needs.

In group meetings, mainly the group discussion method was used. However, since the user need study is relevant in the very early stages of the design, also some aspects of the brainstorming method were used. The idea of the group meetings was to be innovative (brainstorming), but concentrate on near-future, travel-related information. Therefore the concept of group discussion was used when discussing information needs related to travelling. The concept of brainstorming was used when service ideas related to shopping, festivals, exhibitions, travelling in unfamiliar environment and locating objects were discussed. However, the participants were asked to rate individually the importance of each listed piece of information and estimate the frequency of using each piece of information in their travel situations. This way some common opinions about the most important or most frequently used information could be presented in the results. However, one needs to keep in mind that this opinion presents only the opinion of that specific group and cannot be generalised to present the opinion of a larger number of users without some additional research and results.

Especially in the development of high technology innovations, more advanced users (as the lead users) can provide essential information for the development (Hippel 1988). Their needs are not, however, representative of the needs of all potential users. In order to reach a large market, the needs of a “typical user” need to be taken into account as well. However, to anticipate the uptake of new technology for as wide a market as possible, it is therefore important to also gather information about other groups, for whom the new technology can be expected to bring some added value. They are not necessarily similar to lead users, who actively seek new technology and are among the first to take up new innovations. To identify these other groups, it is essential to ask who faces problems in the area of activity (in this case mobile navigation) at which the technology being developed is directed (critical users).

In this study, 85 users altogether participated in the group meeting or filled-in a personal two-day diary. The lead users were studied in the group meetings (theme-based groups: students and teenagers) and partly in personal diaries (young and middle aged males). Most of the respondents however were typical users, i.e. users that were interested in information content, not so much in the technology that would provide the information to them. Critical users were studied in three theme-based groups. In this project, three groups of 'critical' users that might gain additional advantages from personal navigation were studied: visually impaired people (who cannot rely on their eyesight), people with memory disorders (who cannot rely on their memory for navigating) and mobility impaired people (who require information about barriers in the whole travel chain before they can even leave home). These 'critical' user groups can provide essential information about user needs not only for themselves, but also for others in

'critical' situations of use: dark or unfamiliar environment, stressful use situation, moving with luggage, pram or bicycle.

## **3.2 Procedure**

### **3.2.1 Diaries**

22 respondents filled-in the diary forms. The subjects were selected from different age, gender and occupational backgrounds to represent as many different people as possible. The subjects were contacted personally by the researchers and therefore personal introduction and possible further information during the filling of the diary was given to the respondents if needed.

Each respondent filled in a diary-form the events and situations in their day, and listed the various information needs that came to their minds in these different situations or events during the day. The subjects were instructed to select two separate active days to fill in their diary. Every information need was also analysed further by the subjects. This was done by asking the respondents to fill-in an additional form (appendix 1) about every single information need they had mentioned in the diary.

### **3.2.2 Group meetings**

#### **Forming the groups**

All together, 11 groups were formed. The focus of the groups were:

1. Daily travelling by car (2 groups)
2. Daily travelling by public transport (2 groups)
3. Making longer trips by car
4. Making longer trips by public transport
5. Theme group - students
6. Theme group - teenagers
7. Theme group - participants with memory disorders
8. Travelling by public transport - visually impaired participants
9. Travelling by public transport - physically disabled participants

With the exception of the theme groups, the groups were formed through a newspaper advertisement where people in different life situations were invited to participate in group meetings concerning moving in everyday life. The group meetings were held at Espoo on weekdays, either during daytime or in the evening. People were asked to set aside three hours for this group meeting and a compensation of 35 Euro was promised to the participants. People willing to participate to the group meeting were asked about the frequency of their daily trips, usual modes of travel and frequency of travelling longer distances. Other background information such as gender, age and situation in life were also asked from the possible respondents. The situation-based groups were selected from these possible participants based on their background information. The participants were selected so that they had a common focus situation (for example, travelling daily to work by car or travelling longer distances by public transport quite frequently) but their other background variables such as gender, age and situation in life varied as much as possible. In order to ease the formation of the groups, they were all gathered from the Helsinki metropolitan area.

The participants to the theme groups (memory disabled, visually impaired, physically disabled, young people and students groups) were selected differently. The participants in the memory disabled group were known to each other since this group was formed from a weekly meeting activity group that is organised by Alzheimer ry, a private organisation that is funded by collections, private donations and public funds mainly from cities in the Helsinki area. The group meeting with visually impaired participants was organised by Näkövammaisten keskusliitto, and the group meeting with physically disabled participants by Kynnys ry and therefore some of the participants were known to each other. Young participants were gathered to the meeting as a group and therefore the participants were friends who spend most of their free time together. However, participants to the student groups were gathered by an advertisement in the students' Intranet and they did not know each other.

### **Procedure of the group meetings**

At the beginning of the two-and-a-half-hour meeting, the participants were told that the purpose of the meeting was to collect data on their information needs while travelling or moving outside their home, school or office. The information needs were focused on a selected situation (travelling by car or public transport/ in a familiar or unfamiliar environment/ either daily, short trips or longer trips). They were asked to recall some of their travelling experiences and start listing different questions or information needs they had during these experiences. The listed information needs were arranged depending on the phase of the trip, when the information was needed. The phases of the trip (for example, for a trip by public transport were planning, going to the stop, travelling and getting to the final destination) were explained to the participants before the meeting started. The theme groups were given tailored themes that differed somewhat from the trip-based themes. The themes are presented in more detail in Appendix 8.

After listing all the information needs during their trip, the participants were asked to value individually the listed information (rate each piece of information with a score from one to five where 1= not important at all and 5= very important). They were also asked to select three, most important pieces of information/services from all the listed ones, and these personal selections were individually explained and discussed in the group. In addition, they were asked to estimate the possible frequency of using the listed information in the future. Finally, the participants were asked to value different characteristics in personal navigation devices by rating different combinations of those characteristics (conjoint analysis).

### **3.2.3 Conjoint analysis**

The personal navigation device characteristics in the conjoint analysis were related to relationship to mobile phones, unit size (figure 2), operational environment and form of feedback. The characteristics (attributes) and selected choices (attribute levels) are presented in Table 1.

Table 1. Attributes and their levels.

Attribute	Attribute levels		
Device	Add-on mobile phone	Separate device	Integrated with mobile phone
Unit size	Small (Nokia 8210)	Medium (Nokia 3310)	Large (Nokia 9110)
Use of navigation services	Only indoors	Only outdoors	Both indoors and outdoors
Format of information	Text	Verbal	Map

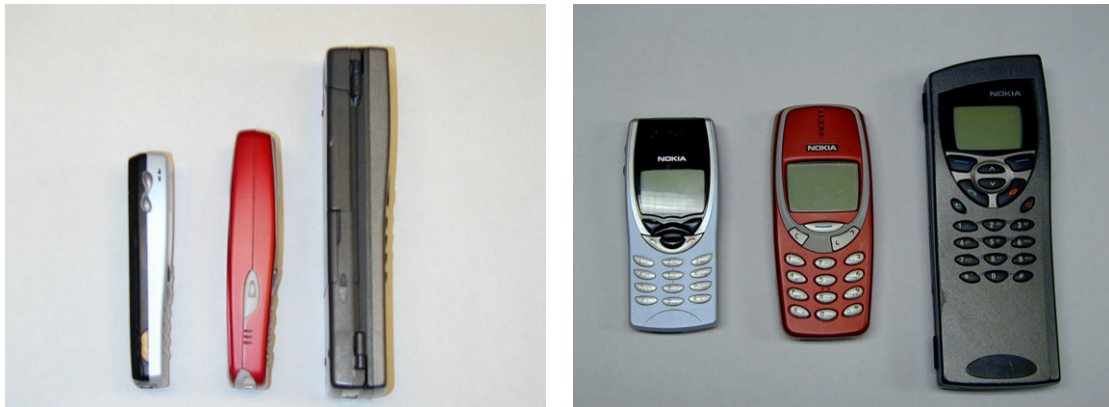


Figure 2. Used examples for different sizes (small, medium and large).

After the selection of attributes and their levels, these models have to be combined in order to generate profiles that can be evaluated by the participants. One possible approach is to construct full profiles, meaning that we have all the possible combinations of different attribute levels. In this case that would have been  $3^4 = 81$  profiles in total (full-factorial design). A common assumption, that there are no interaction-effects between different attributes, was made and therefore in the questionnaire a smaller number of profiles could be used (fractional factorial design). The design also involved learning and holdout profiles, i.e. their ratings were not used to estimate parameters but to let respondents get acquainted (learning profile). The questionnaire, including 11 profiles to be validated by participants, started with the learning profile and ended with a holdout profile. An example of a system profile that was to be evaluated is presented below, in figure 3.

### NAVIGOINTILAITE 4

Laite	erillinen laite
Laitteen koko	<b>pienikokoinen</b>
Navigointipalveluiden käyttömahdollisuus	<b>ulkotiloissa</b>
Tiedon esitysmuoto	puhuttu viesti

Kuinka houkuttelevana pidätte tätä navigointilaitetta?

erittäin epähoukutteleva            erittäin houkutteleva

Figure 3. An example of a system profile that was used in conjoint analysis.

### 3.3 Analysis

#### 3.3.1 Diaries

The information needs (437 altogether) were divided into roughly 30 different categories for further analysis. The information need groups were formed either on the basis of different situations or different themes. 32 information needs could not be categorised to any of the information need groups. Some of the situation-based information needs were further subdivided on the basis of the phase of the situation. In addition, listed information needs that were needed more than once a week or were rated to be as valuable<sup>1</sup> (4 or 5 on a scale from 0 to 5), were picked up from the data and reported separately.

#### 3.3.2 Group meetings

The information needs listed by the participants were written down on post-it notes and placed on the wall to a part of the wall presenting the particular, agreed phase of the trip (planning/trip to the stop/at the stop/travelling on the vehicle/getting to the final destination). The possibility of having the same information need in other phases of the trips was discussed with the participants. The list of information needs in different phases of the trip is based on these results.

After the discussion, the participants were asked separately (by paper questionnaire, where all the listed information was written down) to give an importance score to each listed information and select the three most important ones to them. They were also asked to estimate how often they would need each listed piece of information. With daily trips, the frequencies were

<sup>1</sup> Suomenkielinen vastike lomakkeessa “hyödyllinen”.

‘daily, weekly, monthly, less often than monthly and never’. With longer or less frequent trip, the possible using frequencies were ‘every trip, most of the trips, some trips, only seldom and never’. The scores of the most important or most often used information are based on these results.

### 3.3.3 Conjoint analysis

The analysis was done with the help of SPSS Conjoint 8.0. The conjoint procedure performs conjoint analysis using the ordinary least-squares estimation method. Output from conjoint analysis includes the importance ratings of the attributes and part-worth estimates showing preferences for attribute levels (alternatives). Also correlation relating predicted ratings from the conjoint model with observed ratings could be calculated in the analyses. Some key terms used when presenting results from conjoint analyses are:

- **Utility:** A subjective preference judgement by an individual driver representing the holistic value or worth of a specific object. In conjoint analysis, utility is assumed to be formed by the combination of part-worth estimates for any specified set of levels with the use of an additive model.
- **Part-worth:** Estimate from conjoint analysis of the overall preference or utility associated with each level of each factor used to define the product or service.

In Table 4, the presentation of conjoint analysis results is shown. In the first column, the different functions (attributes) are presented. In the second column the attribute levels (different choices) are presented. The third column indicates the relative importance of the attribute in relation to the overall utility (attribute importance). The relative importance of an attribute is deduced from the absolute difference between the highest and lowest part-worth utility of the attribute-levels of an attribute (column four). This range can be interpreted as the contribution to the sum of the ranges across all attributes. By dividing the range of an attribute by the sum of ranges of all attributes considered in the model, the relative importance of an attribute is represented in percentages (column three), which makes a comparison across attributes possible. This measure is often used in conjoint analysis to indicate the importance of an attribute as compared to other attributes (Hair et. al., 1998).

Table 4. The form of result presentation of conjoint analyses.

<b>Attribute</b>	<b>Attribute levels</b>	<b>Attribute importance</b>	<b>Part-worth utility</b>
<b><i>Device</i></b>	Add-on phone	<b>28.83</b>	-0.0625
	Separate device		-0.9097
	Integrated with mobile phone		+0.9722
<b><i>Unit size</i></b>	Large (Nokia 9210)	<b>23.51</b>	-0.9444
	Medium (Nokia 3210)		+0.3542
	Small (Nokia 8210)		+0.5903
<b><i>Use of navigation services</i></b>	Only indoors	<b>35.53</b>	-0.3472
	Only outdoors		-0.9861
	Both indoors and outdoors		+1.3333
<b><i>Format of information</i></b>	Text	<b>12.13</b>	+0.3264
	Verbal		-0.4653
	Map		+0.1389

## 4 Information needs in everyday life - diaries

### 4.1 Respondents

Altogether, 22 respondents filled-in the diary. Their age ranged from 16 to 73. 13 of them were females and 9 were males. Some of their background variables are presented in table 5.

Table 5. Respondents in the diary study.

<b>Gender</b>	<b>Life-situation</b>	<b>Age</b>	<b>Living environment</b>
Female	Student	16 years	Bigger city
Female	Working	28 years	Helsinki area
Female	Working	31 years	Helsinki area
Female	Working	31 years	Helsinki area
Female	Housewife	36 years	Smaller city
Female	Working	36 years	Helsinki area
Female	Working	40 years	Helsinki area
Female	Housewife	42 years	Helsinki area
Female	Working	48 years	Helsinki area
Female	Working	49 years	Smaller city
Female	Working	55 years	Helsinki area
Female	Working	58 years	Helsinki area
Female	Pensioner	68 years	Helsinki area
Male	Student	18 years	Smaller city
Male	Working	28 years	Helsinki area
Male	Working	30 years	Helsinki area
Male	Working	30 years	Helsinki area
Male	Working	42 years	Bigger city
Male	Working	44 years	Bigger city
Male	Alternation leave	52 years	Smaller city
Male	Pensioner	65 years	Smaller city
Male	Pensioner	72 years	Helsinki area

### 4.2 Data classification

Because of its very free form and detailed level of information collection (personal diaries), the respondents filled the questionnaire in random, individual and very different situations. Therefore the results are collected together and presented in four different groups or levels of user need in everyday life;

- common situations
- common themes

- examples
- cases

*Common situations* were similar events in everyday-life that were found in more than one diary. In other words, the event happened during the two-day period in which the respondents were keeping the diary to more than one person, and there were clear similarities in the questions raised or problems defined in those events. The information needs (questions and problems in common situations) can therefore be described as situation-dependent information needs that are usually independent from the person.

*Common themes* were questions or problems arising in different situations that were dealing with a common theme (weather, price etc.). In other words, the same information needs could be mentioned in very different situations in the diary of one person or more often in diaries of several respondents. The themes were, in other words, independent from the situation but also independent from the person.

*Examples* were events that were mentioned usually only in one diary but could be generalised to other similar events as well. These examples were usually events happening rather rarely (travelling by plane) or personal events that could be seen as one example of an event that is a part of a larger group of everyday events, for example time or money management.

*Cases* were events that were more individual-related and depended more strongly on the respondents' background. These events were mentioned usually only in one diary or if the event was mentioned in more than one diary, the information needs in a similar situation varied between the respondents a lot.

## 4.3 Diary results

### 4.3.1 Common situations

#### Travelling by car

The event of travelling by car can be divided in three parts: planning the trip and travelling in the car.

When planning a trip by car, the following information needs were mentioned:

- distance and an estimated duration (considering congestion and road conditions) of the trip to the end destination (departure and arrival time)
- weather and road conditions and their possible effect on the trip's duration (or safe driving speed)
- optimising the shortest, fastest (e.g. least congested) or simplest route to the specified destination
- possible congestion or other incidents on a selected route
- the temperature inside the car (use of block heater)

When travelling in the car, the following information needs were mentioned:

- more specific information about the car <sup>2</sup>
- speed limit (current speed limit)

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<sup>2</sup> The following questions were mentioned in this information group –

Is the car technically in good condition – preparing to take the car to the repair shop?

Why is a signal light in the dashboard on?

How much gas is in the car's gas tank?

- cheapest fuel (at which petrol station is the cheapest petrol sold and where is this station located)
- location of “break spots” (rest areas and petrol stations)
- location of the nearest, free parking space
- reminder to go for to specific place (post office etc.) when travelling by car
- route-guidance to an unfamiliar destination/ the location of an unfamiliar destination

For more detailed information about information needs related to travelling by car, see appendix 2.

The information needed most often (at least once a week) was information regarding

- the fastest or least congested route
- the optimal departing time to avoid congestion
- petrol prices at different petrol stations
- road conditions on a selected route
- availability of a spare parking space in a car park

Almost every information need related to driving was rated by at least one person to be as valuable as 4 or 5 (on a scale from 0 to 5).

### **Travelling by public transport**

The event of travelling by public transport can be divided in analysis phase in four parts: planning the trip, travelling to the stop and waiting at the stop, travelling on the public transport vehicle and finally, getting to the final destination from the stop.

When planning a trip by public transport, the following information needs were mentioned:

- various existing possibilities to make the trip (train, bus, underground etc.)
- suggested fastest, easiest (no changing etc.) or cheapest way of making the trip
- time schedules for specific lines
- real-time bus stop time (notification when person needs to leave for the stop)
- which is the correct stop and where is it
- the duration of the trip

When travelling to the stop or waiting at the stop for the next bus, train or other public transport vehicle, the following information needs were mentioned:

- real-time information about the stop time<sup>3</sup>
- price of the specific trip and possibilities of buying the ticket (where)

When travelling on the public transport vehicle, the information needs are usually related to getting off at the correct stop and getting information about changing to another public transport vehicle. The following information needs were mentioned in the diaries:

- route optimising (if plans have changed for some reasons etc.)
- guidance when changing<sup>4</sup>
- guidance to get off at the correct stop<sup>5</sup>

For more detailed information, see Appendix 3.

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<sup>3</sup> The real-time bus stop time was written down in diaries as “the stop time of specific line” or “the stop time of next arriving line”.

<sup>4</sup> The guidance when changing was either information about the correct stop when the respondent should change and/or guidance to the correct stop

<sup>5</sup> Information needs related to getting off were either question about the nearest stop to the final destination and/or reminder to tell what stop one needs to get off at.

The most often (at least once a week) needed information related to public transport was:

- the time at which the bus arrives at the station or leaves it (or the timetable)
- the duration of the trip
- information about which buses go to the particular destination

The previous three information types were also rated to be the most valuable ones. In addition, the price of the bus tickets and the line number of the bus coming next to the station were also rated to be as valuable as 4 or 5 (on a scale from 0 to 5).

## Shopping

When studying the information needs related to shopping, three different phases in the shopping event could be recognised in the analysis phase. Those stages were as follows: deciding (making a list) what has to be bought (planning), selecting the shop(s) and information needs inside the shop(s).

When planning the shopping list or making decisions about what has to be bought, the following information needs were mentioned:

- what is needed at home (what is missing from the refrigerator)

When selecting the shop(s), the following information needs were mentioned:

- at which shop is the specific product available<sup>6</sup>
- what kind of products are available in a specific shop
- information about the location of the shop (the nearest shop(s) or shops on a specific route)
- information about the freshness of a specific product in different shops
- the opening hours of selected shop(s)
- products on special sale and prices in different shops
- information about the queues in the shop(s)

When inside a shop, the following information needs were mentioned:

- products on special sale and prices in that shop
- price of a specific product
- freshness of a specific product
- location of a specific product (inside the shop)
- product specific information<sup>7</sup>

For more detailed information see Appendix 4.

The information needed most often was usually related to buying daily consumer goods e.g.

- what is missing at home
- products on special sale and prices
- location of a specific product inside the shop
- amount of people and queues in the shop

Most of the information needs related to shopping were rated as high as 4 or 5 by at least one person.

## Other often needed information

When waking up, people needed to know the time and the date.

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<sup>6</sup> When looking for specific product the most important factors beside the availability information in search and selection of the shop was product price and products' package size.

<sup>7</sup> E.g. installation and general instructions, and information about the suitability for a certain kind of usage.

At lunchtime, several people faced the following questions:

- what lunch alternatives are available at different lunchrooms/restaurants
- the prices of different lunch alternatives.

Many people are also interested in TV programs at different times and on different channels.

School children and their parents need information about the daily schedule at school.

There are also some common questions people are facing when having or making a phone call:

- is the person I am calling at home at the moment?
- what is the cheapest combination of telephone operators (both the call maker and the receiver of the call have more than one telephone numbers)?
- who is calling? (do I have to answer?)

In the late evening and in the night, people want to make sure they wake up in the morning. They are concerned whether the alarm clock is on.

### 4.3.2 Common themes

#### Weather and road conditions

Under the theme of “weather and road conditions” were three different sub-themes: slipperiness and road conditions, weather conditions and weather forecast. In the following, some examples of each sub-theme are listed. For more detailed information about information needs concerning weather and road conditions, see appendix 5.

Information needs related to the “slipperiness and road or surface conditions” theme:

- is the specific route slippery (are there slippery parts in the route)<sup>8</sup>
- which route out of the possible ones is the least slippery (when walking)
- what is the road surface temperature compared to the air temperature (people make conclusions about the slipperiness of the road with this information)
- conditions of ski tracks or skating rink (what is the snow temperature, is the ice on the skating rink hard enough etc.)

Information needs related to the “weather conditions” theme:

- weather at the moment at a specific place<sup>9</sup>
- continuity (time or distance) of some specific weather condition (rain, fog etc.)

Information needs related to the “weather forecast” theme:

- weather forecast to the next day (deciding on the mode of transport for the next day’s trips etc.)
- possible changes in weather during the day (is it going to rain etc.)

Most of the information related to weather and road conditions was needed at least once a week. Only information about weather in another country or related to weathering household linen or carpets were not needed as often.

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<sup>8</sup> The information need about slipperiness was mentioned when travelling with car, with public transport or walking.

<sup>9</sup> Weather conditions at some other city where the person is travelling, weather conditions nearby but in different environment (at lakes’ ice etc.) or rapidly changing weather conditions rain etc. (deciding if walking or taking public transport etc.)

Information about the slipperiness of the sidewalks as well as the current and forecasted temperature and rain situation were rated as high as 4 to 5 by at least one person.

### **Situation somewhere else**

Under the theme of “situation somewhere else” were two different sub-themes: situation at the moment somewhere else and forecasting the situation. In the following, some examples of each sub-theme are listed (for more specific information see appendix 6).

Information needs related to the “situation at the moment somewhere else” theme:

- is there traffic congestion or other incidents on a specific route
- are there (long) queues at shop, restaurants, automatic cash dispensers (Otto etc.) or airport check-in
- how many people (is the “congestion”) are there in a specific place (restaurant, shopping centre etc.)
- is there a free parking space in a specific car park

Information needs related to the “forecasting the situation” theme:

- forecasting all situations mentioned above in the “situation somewhere else” theme
- when are people coming to a specific restaurant (after a large event nearby etc.)

Information about queues in shops, at automatic cash dispensers etc. was needed at least once a week and it was also valued as high as 4 to 5 at least by one person.

### **Locating a person**

Under the theme of “locating a person” were three different sub-themes: where is the person located, is the person in a specified area and what is the condition (monitoring) of the person. In the following, some examples of each sub-theme are listed (for more detailed information see Appendix 6).

Information needs related to the “where a person is” theme:

- where is the person located<sup>10</sup>
- in which location the person is on a specific route

Information needs related to the “is person in a specified area” theme:

- is someone already waiting at the agreed place (child etc.)
- is someone already in the specific area or building<sup>11</sup>

Information needs related to the “monitoring the condition of a person” theme:

- Has a child woken up in a car
- Is someone waiting already anxiously at the meeting place
- How are children doing at home (are they arguing etc.)

In this group, the most valuable information needs were usually related to the location or state (e.g. is the child left in a car still asleep) of a child. Those information needs were also needed at least once a week as well as the information about who is in at the office or if someone has already arrived at home or at the office.

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<sup>10</sup> e.g. where are the colleagues sitting in the train or where is a colleague on the airport or in a hotel?

<sup>11</sup> Is someone at the work office, is the person coming to pick you at the airport already etc.

### **Locating animals, belongings, places or services**

**Animals** - information related to animals was needed in connection with ice-fishing competition (where is the fish) or taking a dog for a walk (are there many other dogs out at the same time and the gender of the other dogs).

**Belongings** - people needed information e.g. about the location of their handbag, calendar, coat, car or a certain product in a shop. One person had a specific service idea about locating things at home (see appendix 7).

**Places or services** - people needed information e.g. about the location of a shop, a restaurant, a bus stop or a platform, their hotel, gate X at the airport or a certain room in a building.

#### **4.3.3 Examples**

**Services (restaurant etc.)** – information needs related to different services were finding a restaurant which suits some specified requirements, more detailed information about menus and prices in different restaurants and the location and business hours of a selected restaurant.

**Ordering a taxi** – information needs related to getting a taxi were locating the person ordering the taxi (location of the user), estimation about the distance, duration and cost of a specific trip by taxi and knowing the address of the destination

**Travelling with by train** – information needs when travelling by train were information about where the ticket can be bought, what is the number and location of the right platform and when does the next train to a certain destination leave.

**Travelling by plane** – information needs when travelling by plane were divided in two parts in the analysis: information needs before the flight and information needs during the flight. *Before the flight*, the information needs were: how much time needs to be set aside to get to the airport, what and where is the right boarding gate (also information about possible changes) and real-time information about boarding time. *During the flight*, the information needs were: is the next seat free, what is the estimation of the actual landing time and where is the arrival gate of the current plane and where is the boarding gate of the next plane.

**Travelling abroad** – when travelling abroad, the information needs were related either to booking the trip or leaving for the trip. Information needs when *booking the journey* were related to possible special offers (are there any cheap standby flights left to a certain destination etc.). Information needs for *leaving for the trip* were related to time at the destination, the exchange rate of the currency at the destination and the weather at the destination.

**Occasions, happenings** – information needs related to events or different happenings were listed to include local happenings, theatrical performances on a certain day in a certain city or the result of a game already played.

**Library** - information needs that were related to library were the due date of the borrowed books and information as to whether it is possible to re-borrow the books.

**Monitoring home, vehicle etc.** – information needs concerning monitoring the respondents' belongings were listed to include questions such as “did I remember to lock the door (at home or the doors of the car)” or “did I remember to turn off the coffee maker”.

**Money management** – information needs for money management were related to bank account (how much money do I have money in my bank account) or stock trading (when would it be profitable to trade shares).

**Computer-related information needs** – information needs concerning computer, e-mail and the internet were listed to include questions such as “what is said in a certain e-mail (when the person was not at the computer)”, “what is the best/most economical/most effective internet service provider for home use”. Also different instructions concerning computers and their use were mentioned in this example group.

**Data (addresses etc.)**- the address, e-mail-address, phone or mobile phone number of a person or several persons was needed in different situations. Also the contact information of somebody travelling abroad or their address at the current time were needed (e.g. when ordering a taxi).

#### 4.3.4 Cases

##### *As an example of free-time activities: ice-fishing*

###### *Before ice-fishing at home*

- is it easier to walk or to ski on the ice (do I take my skis with me)?
- what is the weather on the ice (right clothing)?

###### *On the ice*

- where is the fish?
- how to find a certain islet in the high sea?
- what jig would be the best?
- how long does it take to walk/run back to the target area?

##### *Easy-access database usage in different situations*

###### *Cooking and food*

- information needs related to recipes
- questions about the compatibility of different foodstuff e.g. accompaniments or spices
- questions about the healthiness of the food, e.g. the amount of fat or minerals in the meal
- how long does it take before you are hungry again after eating the meal
- information needs related to freezing or melting something
- questions about pots

There was also a service idea in this information need group. It was about planning the next week's meals. For further information see appendix 7.

###### *Health-care*

In this group there were questions about allergies, the healthiness of food, back or neck ache, slimming or gaining weight, health-care services and physical exercise.

***Other information needs***

There were also several information needs related to cleaning, renovation, beauty care, the thoughts of another person and many other questions.

**4.3.5 Willingness to pay for getting the mentioned information**

The subjects were willing to pay for about two thirds of their information needs. The data slightly implies that the use of information being related to safety, health or saving money increases the willingness to pay for the information. The data also indicates that subjects between 35 and 55 would be most willing to pay for individual information. There were no differences between women and men. It also might be that the subjects would be more willing to pay for information related to car driving, especially in unfamiliar places, locating a person, the state of a person and health.

The fact that the data consists of very various information needs restricts the drawing of the conclusions and the results concerning the willingness to pay can be considered to be only suggestive. In addition, because the information needs were asked at a very detailed level, a great proportion of information needs in one situation or moment were divided in the data collection into more detailed parts and questions regarding information needs. Therefore the question as to whether the respondent would be willing to pay for the information might be in some cases misleading. The respondent might not be willing to pay for one part of information or detailed question, but would be willing to pay for the relevant information combination (content of one service) when offered as a service. In addition, one needs to keep in mind that the willingness to pay was rather high (2/3 of all information needs) and is based only on the respondents' own estimation of her/his future behaviour. However, this willingness to pay can be seen as indicator of "easiness of obtaining this information at the moment" and might give some ideas of possible services ideas in the near future. However, more research is needed to be able to define at a more detailed level what would be the service contents (combined separate information needs or answers to detailed questions) that people would be willing to pay for, how much they would be willing to pay and how often they would actually use the services providing this information.

## **5 Information needs of mobile people – group discussions**

### **5.1 Groups and respondents**

Altogether, eleven groups were formed. Five of them were theme-based and six of them were situation-based (travelling daily trips or longer trips either by car or by public transport). In the theme-based groups, two of the five groups were so-called possible lead-user groups (teenagers and young students group). The other three of the five theme-based groups were critical user groups e.g. users that are expected to maybe have additional user needs (memory disorder, visually impaired and physically disabled participants).

In each group, there was between four and seven participants. More detailed information about the participants is presented in Appendix 8. The group meetings were led by one researcher and another researcher was participating in the meeting, but only by writing down the discussed issues etc. The discussions were taped with the permission of all the participants (asked before starting the discussion). In next chapter, only the summary of the results is presented. However, a more detailed report of the group meeting is presented in Appendix 8.

### **5.2 Summary of results from group discussions**

#### **5.2.1 Daily travelling by public transport**

Five of the groups were discussing the information needs when travelling daily trips by public transport. There were three theme-based groups (visually impaired, physically disabled and memory disordered) and two situation-based groups (technology students and situation group formed from very different public transport users). The more detailed group specific results are presented in Table 6.

Table 6. The user needs of different groups of respondents when travelling daily trips by public transport.

	Situation groups	Visual impaired group	Physically disabled group	Memory disorder group
<b>Planning the trip</b>				
Time schedule	X	X		X
Possible modes and routes	X	X	X	X
Route optimisation (selected criteria)				
-criteria such as unobstructed environment/stop		X	X	
-criteria such as fastest, number of transfers	X			
-criteria such as nearest to the end destination	X	X		
Information about special vehicles (low floor etc.)			X	
Information about changes (incidents, delays etc.)	X		X	
Estimated stop times (start/destination stop)	X	X	X	
Real-time stop times (start/destination stop)	X		X	
Reminder, when to leave home (walking time)	X			X
Conditions of route (winter maintenance etc.)		X	X	
<b>Trip to the stop</b>				
Guidance to the correct stop or platform	X	X	X	X
Information about constructed infrastructure		X	X	
Information about rapidly changing infrastructure		X		
<b>Waiting at the stop</b>				
Real-time stop time (next suitable vehicle)	X		X	
Possible delays and cause of those delays	X		X	
Possible/alternative lines to the destination	X			
Finding or stopping the correct vehicle		X	X	X
Guidance to the door and inside the vehicle			X	
<b>Travelling inside the vehicle</b>				
Paying fare (buying and stamping the ticket)		X	X	X
Route of vehicle and current location	X			X
Real-time arrival time (destination stop)	X			
Real-time stop times (connections etc.)	X			
Line number of the vehicle				X
Getting off at the correct stop				
-which is the nearest stop (final destination)	X	X	X	X
-when is the vehicle at that stop	X	X		X
-reminder to get off	X			X
Stopping the vehicle and getting (slowly) off		X	X	
<b>Changing mode or vehicle</b>				
Real-time stop times for both vehicles	X			
Guidance to the correct stop	X	X	X	
<b>Getting from the stop to the final destination</b>				
Finding the (unobstructed) way out from large terminals		X	X	X
Map with street names, buildings and terminals	X			
Directions (Kilo XX km) for different directions	X			X
Guidance (direction) to the final destination	X	X	X	X
Route selection (easiest, unobstructed etc.)		X	X	

### 5.2.2 Daily travelling by car

When **planning a daily trip** by car, the information needs were listed as:

- information about unpredictable congestion (accidents etc.)
- information about possible incidents and events (road works, special happening, oversized vehicle etc.) affecting the trip (time and route)
- route optimisation (fastest, shortest, most comfortable etc.)
- information about road conditions (mainly during wintertime)
- estimated trip duration
- information about parking (vacancy, price, payment methods etc.)
- information about other possible transport modes (public transport)

Participants emphasised that the real-time information about incidents, events and accidents that affected the route selection and travel time was important. It was stated that in a familiar environment, the route optimisation and estimated travel time should include this information and the route selection should be based on this dynamic traffic condition information. During the wintertime, information about road conditions (and maintenance) was stated to be important even when travelling short, daily trips. Also information about parking possibilities and more detailed information about price and payment method was seen to be useful. The participants also indicated that it would be useful to have information about other transport modes as well (public transport), since the participants were not very familiar with, but still sometimes maybe willing to travel by public transport to the city centres for example.

Information needs while **travelling by car** were partly similar to pre-trip information needs. The on-trip information needs were listed as:

- information about possible events or traffic incidents and re-calculated travel time estimation
- real-time information about the actual ending time of a large event (ice hockey game etc.)
- information about other possible routes (in case of unexpected event or incident)
- information about petrol prices and location of a specific petrol station (cheapest)

Additional information about the cause of congestion or delays was indicated to be important as well. When travelling in an unfamiliar environment, guidance directions while driving (car navigation) was indicated to be useful. Especially when looking for a specific address, guidance would be very useful (street name, building number). Car navigation was also stated to be useful in familiar environments by participants with a minor memory disorder.

**At the final destination**, the information needs were usually related to parking. Automatic payment method optimising the time paid for (starting when arriving at the car park and stopping at the time of leaving) was stated to be useful. Participants stated that information about the nearest free and authorised parking place would be very useful, especially in the city centre area. The participants emphasised the importance of real-time information providing the driver with information such as:

- whether it is legal to park in a specific place for the duration needed
- how much it will cost to park there
- what the possibilities to pay for the parking are (mobile phone, cards, coins etc.)
- what the business hours of the car park are (how long is it open for)
- guidance when leaving especially larger car parks was indicated to be useful (location of exits, directions, street names etc.)

**The most important information** was real-time information about incidents, events and accidents affecting the route selection and travel time. Re-routing the itinerary while driving (based on dynamic traffic information) was indicated to be important as well. Also information about parking places was indicated to be very important. Guidance in an unfamiliar environ-

ment and information about road conditions during wintertime were also indicated as important information. Real-time information about congestion (or traffic density), route optimisation based on real-time traffic information and estimated real-time travel duration were indicated to be the most often used information.

### 5.2.3 Making longer trips by public transport

**Planning** seemed to play a very important part when making longer trips by public transport. When planning longer trips by public transport, the information needs were:

- what are the possible transport modes (bus, train etc.) and routes to the destination,
- what is the most suitable transport mode, route and line,
- is there vacancy at the selected shift (reservation)

The participants emphasised that information including all possible connections (train, bus, aeroplane etc.) to the final destination is the most important information when planning the trip. The most suitable transport mode, route and line is then usually selected from these possibilities with different criteria. The criteria could be the location of stops (closest to the start point/destination), prices, travel time and comfort-related issues. After selecting the most suitable mode, route and line, the participants indicated that real-time information about vacancy in that shift and the possibility to make a reservation would be useful.

Most of the information needs when **travelling to the stop** were related to travelling on the local public transport network. The information needs were related to real-time information about the stop times (especially at the destination stop when changing to the long-distance vehicle) and route optimisation. The reliability of the shorter trip by public transport was the most important issue, since being late would cause missing the long-distance connection. **In larger terminals**, information needs were as follows:

- advance information about the possibility of long lines at ticket office and information about alternative possibilities to purchase the tickets
- information about lockers and services in the terminal area
- real-time information about the stop time (especially if there has been some changes, i.e. delays or re-arrangements)
- information about changes and possibilities to re-route the trip in case of unexpected changes

The information need **when travelling inside the vehicle** were:

- finding the correct vehicle (confirmation) and seat, but also information about special situations or changed schedules
- getting off at the correct stop
- guidance when changing from one vehicle to another one (real-time stop time for both vehicles, guidance to the correct transfer stop etc.)
- information about estimated travel duration (when arriving) to the final destination and current location of the vehicle on its route
- information about the closest stop to the final destination and announcements about the next stops (in an unfamiliar environment)
- information about other possibilities to continue the trip (in the case of unplanned changes, delays etc.)

When **travelling from the stop to the final destinations**, the information needs were usually related to travelling in an unfamiliar environment. All participants indicated that it would be useful to have some kind of guidance to the final destination. The guidance should include information about the main buildings, street names and other stations, terminals and stops.

**The most important information** was information about possible modes and routes and time schedules. Also information about prices, the most suitable mode and route and travel time (estimation) were selected more often to be one of the three most important information. According to the participants, the most frequently used information would be the estimation of the total travel duration.

#### 5.2.4 Making longer trips by car

When **planning** longer trips by car, the information needs were:

- information about other road users (congestion)
- information about accidents (or other special events)
- estimated travel time to the final destination
- route optimising (speed limit, road works etc.)
- services and attractions on the route.

The participants emphasised that information about congestion and special events (accidents) was useful when making longer trips, since there usually are more possibilities to either select another route or re-schedule the planned route. Information about the best route<sup>12</sup> selection was indicated to be useful, especially if it was based on dynamic traffic information (on-trip re-routing). Some participants stated that it would be nice to have information about services, attraction and other points-of-interest as well.

**On-trip information** needs were similar to the information needs when planning the trip.

- real-time information about congestion, events or accidents
- information about estimated delays and possible detours (time estimation)
- information about air/road temperature or warning about slippery roads (during the wintertime)
- on-trip route guidance (car navigation) if travelling in an unfamiliar environment
- detailed maps (street names, main buildings etc.) of the destination city
- information about the location of the nearest services (petrol station, restaurants, towing, garage etc.) or rest places

Some participants stated that additional information about services (food, shops etc.) at those petrol stations would be useful as well. More detailed information about possible technical problems with your own vehicle and information about towing services etc. could be important if a problem occurs. Safety-related information such as warnings about animals on the road or an approaching emergency vehicle and rapid changes in road conditions were stated to be important by some participants. Also speed recommendation and warnings near schools were indicated to be important.

At the **final destinations**, information about parking (nearest place, price, safety etc.) was stated to be important both in familiar, but especially in unfamiliar cities. Also a map with street names or other guidance instructions was indicated to be very important. Sometimes additional information about the location of certain services (pharmacy, florist, cash machines etc.) would be useful as well. If connection with a different transport mode is needed, information about parking and more detailed guidance to the correct stop or platform was indicated to be useful.

**The most important information** was guidance in an unfamiliar city, car navigation and guidance if a detour is required. Also information about accidents and congestion were se-

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<sup>12</sup> Criteria for selecting best route varied quite much depending on participant and situation. Some criteria mentioned during the discussion were the fastest (speed limits) route, most comfortable route (road works, traffic light etc.) or services or attraction on the route.

lected more often to be one of the three most important information. According to the participants, the most frequently used information would be the estimation of total travel duration.

### 5.2.5 Locating static or dynamic objects: service ideas

The ideas of possible service solutions for this technology were related to:

1. locating people
2. locating other moving objects (vehicles, animals etc.)
3. using users' location when locating services or giving guidance

When (1) **locating people**, the possible service ideas were mainly related to special groups or special situations:

- prisoners when moving outside the prison
- elderly persons or demented patients
- people who are possibly in danger (getting lost, accident etc.)
- own children
- friend or spouse in situations where the person concerned has consented to being located (shopping, exhibitions, crowded event or place etc.)
- a larger group travelling together etc. (possibility to locate the group members)

However, privacy issues and misuse of this information was brought up as major concern in this discussion. Participants were not aware of technical possibilities or legislation related to location and were adopting quite easily the opinions and beliefs of other participants. The participants emphasised that a person should always be able to refuse being located and especially that this information be transmitted to someone else. Over all, it was seen more acceptable if the locating is based on the persons' own activity (asking to be located). Also the cost, the actual gain of all these services and the possibility of increased official supervision were a concern for some of the participants. The participants also indicated that the services should be provided to typical mobile phones or other common portable devices (device-independent). Some participants were more concerned regarding the privacy issues and the development of society if people are able to locate each other with widely spread solutions.

Service ideas (2) **locating other moving objects** were:

- locating the users' own vehicle (stolen vehicle or forgetting the exact location of the parking place)
- locating public transport vehicles (real-time information to travellers)
- locating animals (hunting dogs etc.)
- locating participants' smaller items such as a mobile phone, bike or keys

Listed service ideas that were using the **user's location information** (3) were often related to moving in an unfamiliar environment and therefore guidance as part of the service was seen important. Guidance (map) that has street names and buildings and the user's own location was indicated to be useful. Guidance should include clear directions as to how to get to the end destination and information about the time required to get to the destination. Ideas for locating services included:

- guidance in an unfamiliar environment (map showing where the user is located)
- location of restaurants, cash machines, civil service departments, beaches (abroad) etc.
- additional information related to locating services (services' business hours, prices, special offers etc.)
- using user location when ordering a taxi
- saving and possibly sending the location information to someone else (location of mushrooms, berries, special birds etc.)

- weather forecast and probability of rain based on the users' location or the location to which the user is travelling
- following a sporting event that is spread in a large area, for example orienteering

### 5.2.6 Shopping – service ideas

The information needs related to shopping were:

- finding a product or product group
- finding information about a selected product
- finding services: (nearest) restaurants, cafes, lockers, toilets, cash machines or shops providing similar product
- additional information about services and shops (menus and prices of selected restaurants, payment methods, next available free time at hairdresser etc.)
- real-time information about congested hours (number of people in shop etc.) of different shops or services
- indoor guidance in large shops or shopping centres
- information about sales (information regarding when the sale is starting or information about special offers at selected shop)

Participants indicated that information about the location of a product or product group was needed differently in different situations. Basic information could include information about the shops and the location where the product can be found (especially products that might be hard to find), but sometimes also guidance to the shop. Additional parameters such as lowest price or specific size might also be added as a selection criteria. In large shops, location information regarding the product might be useful even when inside the shop. With special products (seasoning, ingredients for baking, fruitage etc.), the information might also be useful if the participant does not know what the product looks like. Also more detailed information might be needed about selected products. This information might be related to the materials used, care instructions or guarantee.

Also the possibility to pay with a portable device (such as a mobile phone) was seen very useful. The portable device could be used as a bankcard: the user could deposit some money to the “mobile phone account” and then use it in shops or when paying for other articles with the portable device. Articles and services that were listed in the group discussion were movie tickets (booking and paying), train or bus tickets, candy machines and petrol.

### 5.2.7 Travelling in an unfamiliar city – service ideas

Information needs when travelling in an unfamiliar city were related to:

- map (streets, buildings, agreed meeting places, terminals, stops etc.)
- information about different areas in the city (parks, beaches, slums etc.<sup>13</sup>)
- information about attractions, points-of-interest (POI)
- information about events (needed both if participating in the event or bypassing it)
- information about services (restaurants, and places where bicycles or cars can be hired)
- information about different tours (destination, prices etc.)
- information about public transport (the price and payment methods<sup>14</sup>, the reliability of time schedules and the safety)

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<sup>13</sup> Participants indicated that for example information about how safe a specific area is would be important if travelling abroad. Also information about parks, beaches and other larger area or places for leisure activities (beaches, football courts etc.) was indicated to be useful.

- information about taxis (the prices, payment methods etc.)
- dictionary

Maps were indicated to be the most important need when travelling in unfamiliar environments. Information easing the finding of the nearest service was indicated to be important, especially if looking for a pharmacy, police station, doctor or the Finnish consulate. Additional information needed after locating a shop, restaurant or liquor-store was business hours, information about the menu and prices for example. Guidance to a selected destination (attraction, hotel etc.) including the trip duration was indicated to be important when moving in unfamiliar environments.

When discussing the possible service solutions for guidance in an unfamiliar city, one proposal was an electronic map including information about street names, buildings, attractions and points-of-interest, where the real-time information of the users' location would be shown as a red dot. However, the participants stated that it would be important that the user is able to select her/himself which buildings or attractions are shown on the map. Also the location of the requested service could be shown on the map. The reservations about this kind of service were mainly related to the reliability of the information and cost to the user.

The information needs when planning the trip were related to money (exchange rate of the foreign currency, estimation of price levels in that country etc.) and the country's culture and customs when travelling abroad. Also information about the different possibilities to travel to the destination (modes, travel time, price etc.) was indicated to be important.

### 5.2.8 Festivals, exhibitions - service ideas

The information needs related to **planning** a visit to a festival, exhibition etc. were:

- information related to staying overnight (possibilities, prices, locations etc.)
- information related to travelling to the event (both by car and public transport)
- information about services and payment methods in the area

Participants emphasised especially the importance of travelling information: possible modes, lines and shift, guidance to the correct stop, where to get off and guidance from the stop to the final destination and information about parking possibilities if travelling by car.

When **arriving to or at the event area**:

- a map including information about the location of different services
- additional information about queues at those services or menus and prices
- information about a specific location and starting time of different events (especially if there was some change from the announced schedule)
- a real-time reminder of the starting-time of a selected performer and the location of the stage (one participant)
- a map of selected exhibitors and possible route optimisation between these points (one participant)
- information about friends' location (for example a map showing the location of friends or the agreed meeting place)

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<sup>14</sup> Information about special prices (two-day ticket etc.) and places where the ticket can be bought.

## 6 Importance of different device characteristics

### 6.1 Respondents

The conjoint analysis questionnaire was filled at the end of the group meeting and therefore the respondents are participants from the group meetings. However, some of the theme groups participants were not included in these analyses, since their opinions and interests might differ quite a lot from those of other participants. These participants were part of the “memory disordered – Alzheimer group”, “visually impaired group” and “physically disabled group”. Unfortunately, the opinions of these user groups regarding the importance of different device characteristics are not studied in this project.

Altogether, 48 respondents filled-in the questionnaire. 24 of them were females and 24 males. Their ages ranged from 17 to 74. However, 40% of the respondents were under 25 years of age. Therefore the possible differences between age groups cannot be analysed.

### 6.2 The “preference of different characteristics” model

The relative importance of an attribute is deduced from the absolute difference between the highest and lowest part-worth utility (different choices of characteristics) of the attribute-levels of an attribute. This range can be interpreted as the contribution to the sum of the ranges across all attributes. By dividing the range of an attribute by the sum of ranges of all attributes considered in the model, the relative importance of an attribute is represented in percentages (Table 7.)

Table 7. The relative importance of selected attributes with selected attribute levels.

Attribute	Attribute levels	Attribute importance	Part-worth utility
<i>Device</i>	Add-on phone	<b>28.83</b>	-0.0625
	Separate device		<b>-0.9097</b>
	Integrated with mobile phone		<b>+0.9722</b>
<i>Unit size</i>	Large (Nokia 9210)	23.51	-0.9444
	Medium (Nokia 3210)		+0.3542
	Small (Nokia 8210)		+0.5903
<i>Use of navigation services</i>	Only indoors	<b>35.53</b>	-0.3472
	Only outdoors		<b>-0.9861</b>
	Both indoors and outdoors		<b>+1.3333</b>
<i>Format of information</i>	Text	12.13	+0.3264
	Verbal		-0.4653
	Map		+0.1389

The most important attribute was the possible environment where the navigation device could be used (only indoors, only outdoors, both indoors and outdoors). This is quite natural, since this is the only characteristic that limits the use of the navigation service. The second most important characteristic was the relationship with mobile phones: participants indicated quite

clearly that a navigation device that is integrated with a mobile phone would be most attractive and a separate device would be least attractive. The third most important characteristic was the unit size. Overall, the smaller the device was, the more attractive it was indicated to be. However, the difference between the medium size and the small size was rather small. The participants did not have a clear idea of the best format for the information that was given to them. This might indicate that the format of the given information depends on situation, service and users and detailed research is needed to clarify which is the best solution for each situation, service and user.

Overall, there were only small differences between female and male participants. However, the interesting result is that male respondents preferred maps whereas female respondents preferred text as the format of the given information (Figure 8). The relative importance of selected attributes with selected attribute levels by respondents' gender is presented in Table 10.

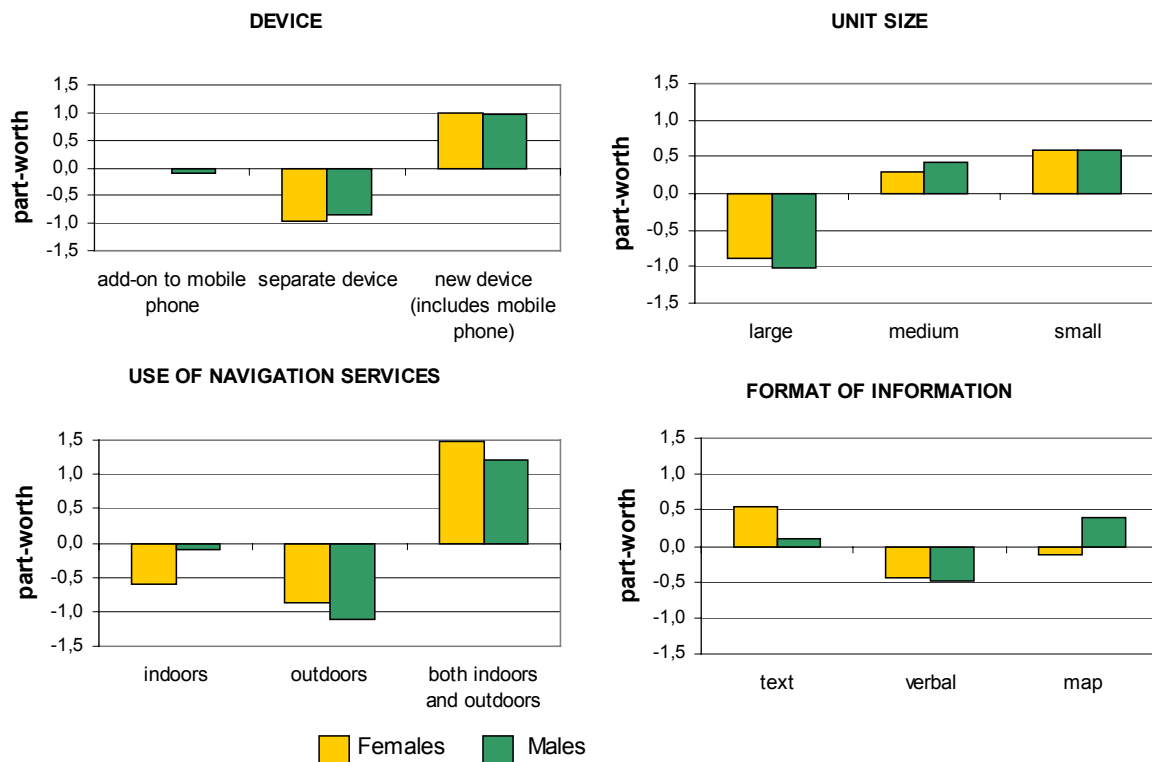


Figure 8. The part-worth utilities regarding the attractiveness of the systems by participants' gender.

The differences were greater between participants in the “car groups” and participants in the “public transport group”. With the selected attribute levels “use of navigation service”, function (indoors, outdoors, both) was considered to be the most important attribute influencing the overall attractiveness of the device profile for participants in the “car groups”. However, “size” (small, medium, and large) was considered to be the most important attribute influencing the overall attractiveness of the device profile for participants in the “public transport groups”. The “device” (add-on, separate, integrated with mobile phone) was considered to be the second most important attribute among participants in the “car groups” and “use of navigation service” among participants in the “public transport groups”. The “format of information” (text, verbal, map) influenced the overall attractiveness of the total system profile the least (Figure 9). The relative importance of selected attributes with selected attribute levels by

respondents' groups topic (travelling by car vs. travelling by public transport) is presented in Table 10.

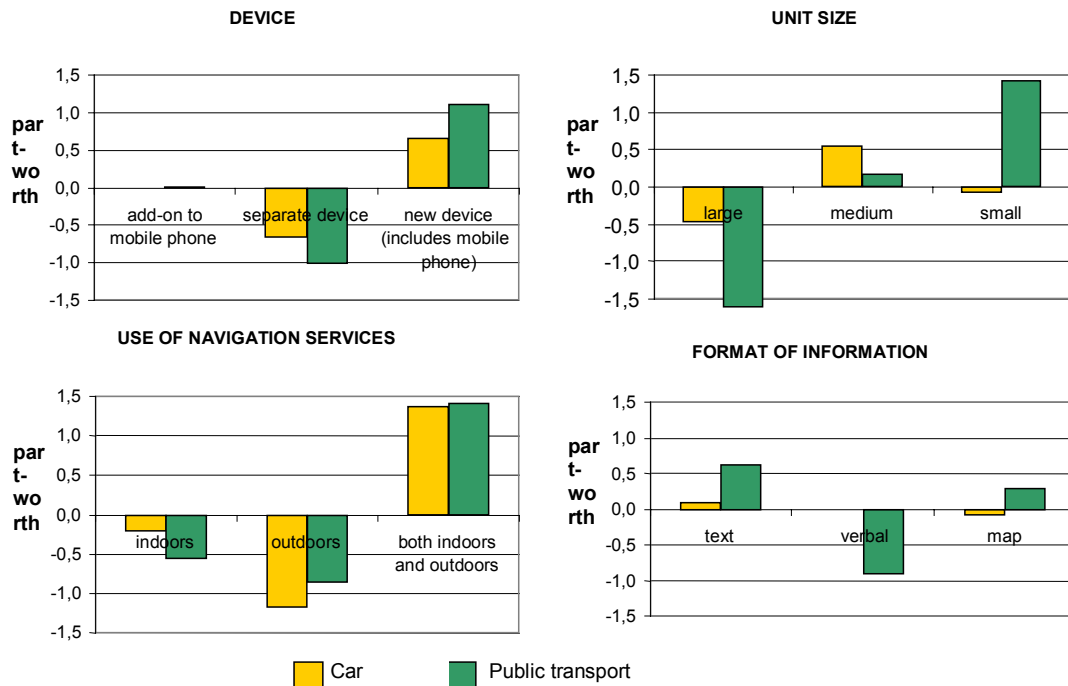


Figure 9. The part-worth utilities regarding the attractiveness of the systems by the topic of participants' group meeting.

Table 10. Attribute importance to overall attractiveness by respondents' gender and topic of the group meeting.

	Females	Males	Car groups	Public transport groups
Device	28.9	27.5	26.0	22.8
Size	21.9	24.1	20.1	<b>34.4</b>
Use of navigation services	<b>34.6</b>	<b>34.9</b>	<b>50.3</b>	25.5
Format of information	14.6	13.5	3.6	17.2

## 7 Summary of results

### 7.1 Information needs when travelling

According to the diaries, the most common and frequent situations in the users' everyday life are related to daily travelling. Both the diaries and the situation-based groups indicated that the most important user information needs in these situations were quite similar. However, there was a lot of additional information needs depending on the user (time critical users, users with special requirements etc.) and the situation (for trips made in a familiar or unfamiliar environment etc.).

#### Information needs while travelling by car

**The most important information when travelling daily trips by car** was real-time information about incidents, events and accidents affecting the route selection and travel time. Re-routing the itinerary while driving (based on dynamic traffic information) was indicated to be important as well. Also information about parking places was indicated to be very important. Guidance in an unfamiliar environment and information about road conditions during winter-time were also indicated as important information. Real-time information about congestion (or traffic density), route optimisation based on real-time traffic information and estimated real-time travel duration were indicated to be the **most often used information**.

**The most important information when making longer trips by car** was guidance in an unfamiliar city, car navigation and guidance if a detour is required. Also information about accidents and congestion was indicated more often to be important information. According to the participants, the **most frequently used information** would be the estimation of total travel duration.

#### Information needs when making daily trip by public transport

**The most important information** was real-time stop time, paper time schedules and estimated stop times. Also real-time destination stop time (forecast) was indicated more often to be one of the most important information. According to the participants, **the most frequently used information** would be estimated stop times, real-time stop times (start and destination stops) and paper time schedules. Also information about incidents was seen to be important, but would probably be relevant less frequently than daily.

The most important information for critical users was mostly related to their possibility to use the public transportation system. In addition to the basic information mentioned above, they indicated the real-time information about unobstructed route to the stop, inside the vehicle and to the final destination to be the most critical information (especially physically disabled users). Also guidance to the stop and guidance to get off at the correct stop was indicated to be important (especially visually impaired users). The critical user groups pointed out that critical users often need similar information to all other users. In addition to this typical information, they often need more detailed information about the environment (walking to the stop, the stop and the vehicle).

#### Information needs when making longer trips by public transport

**The most important information when travelling** was information about the possible modes and routes and time schedules. Also information about prices, the most suitable mode

and route and travel duration (estimation) were selected more often to be one of the three most important information. According to the participants, the most frequently used information would be the estimation of the total travel duration. Naturally, planning seemed to play a much more important role when travelling longer trips by public transport.

## 7.2 Information needs in specific situations

### **Information needs when shopping**

Other frequent situations in everyday life were related to shopping (especially daily groceries). Information needs while shopping varied depending on the situation: daily shopping was supposed to be efficient (needed products, shortest travel distance and time) whereas information needs when looking for specific product were different (finding the product, comparing prices etc.). Inside the shop, the information needs were related to finding the product and getting additional information about selected products.

#### Information needs when **selecting the shop(s)**

- in which shop is the specific product available (looking for specific product)
- information about the location of the shop (the nearest shop(s) or shop on a specific route) and the business hours of selected shop(s)
- products on special offer and prices in different shops
- information about the queues in the shop(s)

#### Information needs when **inside a shop or shopping centre**

- indoor guidance in large shops or shopping centres
- special sales in selected shops
- location of a specific product (inside the shop)
- product-specific information (manufacturer, price or freshness (use by date) of selected products)
- shops providing similar product (if not found at current shop)

When spending time in larger shopping centres, additional information about possible services and shops (restaurants, lockers, toilets, cash machines, next available free time at hairdresser's etc.) was indicated to be useful. Also the possibility to pay with a portable device (such as a mobile phone) was seen to be very useful.

### **Information needs when travelling in an unfamiliar city**

Guidance information in an unfamiliar city was indicated to be the most valued information in the phone interview study that was conducted in part 1 (over 70% of people from Finland were willing to pay for this information). Therefore, detailed information about the content of the guidance service was collected in the group meetings.

Information needs when travelling in an unfamiliar city were related to:

- different areas in the city (parks, beaches, slums etc.)
- attractions, points-of-interest (POI)
- events (needed both if participating in the event or bypassing it)
- services (restaurants etc.)
- different tours (destination, prices etc.)
- public transport or taxis (the prices, payment methods etc.)

When discussing the possible service solutions for guidance in an unfamiliar city, one proposal was an electronic map including information about street names, buildings, attractions

and points-of-interest, where the real-time information about the users' location would be shown as a red dot. Naturally, maps (streets, buildings, agreed meeting places, terminals, stops etc.) were indicated to be the most important information when travelling in unfamiliar environments.

### **Information needs in festivals or exhibitions**

The information needs related to **planning** a visit to a festival, exhibition etc. were related to travelling to the event location (both by car and public transport), the possibilities to stay overnight (prices, locations etc.) and information about services and payment methods in the area.

**At the event area**, a map including information about the location of different services (queues at those services, menus, prices) was indicated to be most important information. Also information or a real-time reminder about a specific location and starting time of different events (especially if there was some changes compared to announced schedule) was indicated to be useful. In exhibitions, a map showing the location of the users' selected exhibitors and possible route optimisation between these points (one participant) was indicated to be useful, especially for large exhibitions. In large events, information about friends' location (for example a map showing the location of friends or the agreed meeting place) was indicated to be important as well.

### **Information needs related to weather and road conditions**

Information needs related to the "weather conditions" theme was either weather at the current moment at a specific place (other city, different environment such as at the icing condition of lakes etc. or rapidly changing weather conditions such as rain etc.), weather forecast for the next day (planning the next day's trips etc.) or possible changes in weather during the day (is it going to rain etc.). Information needs related to the "slipperiness and road or surface conditions" theme were related to the slipperiness of the selected route or the condition of ski tracks or skating rink.

### **Service ideas - locating a person, animals, belongings, places or services**

When **locating people**, the possible service ideas were mainly related to special groups or special situations such as prisoners when moving outside the prison, elderly persons or demented patients or people who are possibly in danger (getting lost, accident etc.). However, locating children, friends or spouse in situations where the person concerned has consented to being located (shopping, exhibitions, crowded event or place etc.) was seen as being useful. Most of the time the information about a person's location was needed in order to tell if she/he is in a specific area (at a railway station, school etc.) or at which location the person is on a specific route (child coming from school, memory disordered users). Sometimes also additional information about the condition of this person (has a child woken up in a car etc.) was needed as well. Locating competitors in sporting events would ease following a sporting event that is spread through a large area, for example orienteering.

**Locating other moving objects** - service ideas locating other moving objects were related to locating the users' own vehicle (stolen vehicle or forgetting the exact location of parking place), locating public transport vehicles (real-time information to travellers), locating animals (hunting dogs etc.) or locating participants' smaller items such as a mobile phone, bike or keys.

**Locating user and places or services** – service ideas where the users' location is used in order to find the nearest service or location-based information were as follows:

- location of restaurants, cash machines, civil service departments, beaches etc.

- additional information related to locating services (services' business hours, prices, special offers etc.)
- using user location when ordering a taxi
- saving and possible sending of the location information to someone else (location of mushrooms, berries, special birds etc.)
- weather forecast and probability of rain based on the users' location

### **7.3 Importance of device characteristics**

When asking the participants about the importance of different device characteristics, the most important attribute (of the selected four – relationship to mobile phone, device size, possible location of using the services and format of given information) was the possible environment where the navigation device could be used (only indoors, only outdoors, both indoors and outdoors). This is quite natural, since this is the only characteristic that limits the use of the navigation service. The second most important characteristic was the relationship with mobile phones: participants indicated quite clearly that a navigation device that is integrated with a mobile phone would be most attractive and with a separate device least attractive. The third most important characteristic was the unit size. Overall, the smaller the device was, the more attractive it was indicated to be. However, the difference between the medium size and the small size was rather small. The participants did not have a clear idea of which was the best format for the information that was given to them. This might indicate that the format for given information depends on situation, service and user and detailed research is needed to clarify which is the best solution for each situation, service and user.

## 8 Conclusions

The results suggest that the most common and frequent situations in the users' everyday life were related to daily travelling. People indicated this information to be important and were quite positive about personalised, real-time traffic information. This information was needed by most of the users daily. The most important information for critical users using public transport were mostly related to their possibility to use the public transportation system. The results from critical user groups point out that critical users often need information that is similar to all other users. In addition to this typical information, they often need more detailed information about the environment (walking to the stop, the stop and the vehicle).

Other frequent situations in everyday life were related to shopping (especially daily groceries) or to weather. Information needs while shopping varied according to the situation: daily shopping was supposed to be efficient (products needed, shortest travel distance and time) whereas information needs when looking for specific products were different (finding the product, comparing prices etc.). Information about weather and road conditions was needed quite often and in different situations. Information needs were related either to weather at the current moment, weather forecast, possible changes in weather conditions during the day or road conditions.

Most of the participants were not familiar with location-based technology and did not have clear ideas of the different possibilities of location-based services. Therefore it was somewhat difficult for them to imagine possible services and even more difficult to forecast their willingness to pay or frequency of using these kinds of services. Spontaneous service ideas related to locating people were mainly related to special groups or special situations such as prisoners when moving outside the prison, elderly persons or demented patients or people who are possibly in danger (getting lost, accident etc.). Service ideas locating other moving objects were mainly related to locating the users' own vehicle, locating public transport vehicles, locating animals or locating smaller items such as a mobile phone, bike or keys. However, the participants did not seem to have a clear idea of how these services might ease their everyday life and therefore they were not very innovative finding out new usage ways of new technology in their everyday life. Therefore new location-based services should be planned and marketed quite clearly directly to answer to questions or problems that people are facing in their everyday life. In other words, solutions should be ready services enhancing the everyday life, not only technical possibilities, where the user him/herself should be able to figure out the possible way of using this new technology. In addition, more research is needed to find out whether the possible everyday solutions (locating children, friends or spouse in situations where the person concerned has consented to being located) would be used and in which kind of situations.

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# Appendix 1

## The diary form for individual information needs

**Kuvaile** mahdollisimman yksityiskohtaisesti tarvitsemaasi **tietoa**?

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Kuvaile vapaasti **miten ja missä muodossa** (esim. tekstinä, kuvana, karttana, puheena) olisit tämän tiedon halunnut saada? Älä mieti, onko se teknisesti mahdollista vai ei, vaan anna ideoiden lentää.

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Miten paljon tiedosta olisi ollut sinulle **hyötyä**? Ympyröi sopiva numero.  
0 = ei lainkaan  
1  
2  
3  
4  
5 = erittäin paljon

**Minkä asioiden kannalta** tiedosta olisi ollut hyötyä?  
Ympyröi seuraavista:  
1. Turvallisuus  
2. Ajankäyttö  
3. Mukavuus  
4. Raha  
5. Muu, mikä \_\_\_\_\_

Jos, olisit saanut tiedon, miten se olisi **vaikuttanut toimintaasi**?

---

---

Jos sinulla olisi ollut käytettävissäsi tämän tiedon tarjoava palvelu, olisitko ollut valmis **maksamaan** tästä yksittäisestä tiedosta?  
1. kyllä  
2. en

**Kuinka usein** tarvitsisit samantyyppistä tietoa?  
1. Päivittäin tai lähes päivittäin  
2. Vähintään kerran viikossa  
3. Vähintään kerran kuussa  
4. Harvemmin kuin kerran kuussa  
5. Vain tämän kerran

**Missä** olit (esim. kotona, työpaikalla, kaupassa ym.) ja, **mitä olit tekemässä** (esimerkiksi kävelemässä bussipysäkillä) silloin, **kun olisit tarvinnut tietoa**?

---

---

Jos olit matkalla jonnekin tai suunnittelemassa matkaa, mikä oli **kulkumuotosi** (esim. auto, jalankulku ym.) ja **mistä minne** matkasi suuntautui (esim. kotoa töihin)?

---

Liittyikö tilanteeseen jotain **yllätyksellistä**, jota et voinut ennakoida tai olit suunnitellut tekeväsi toisin?

1. ei
2. kyllä, mitä \_\_\_\_\_

## Appendix 2

### Travelling by car

1. Onko autossa riittävästi bensa?
2. Reitinsuunnittelu/-optimointi
  - oudossa paikassa opastus kohteeseen/määräpaikan sijainti/osoite
  - helppokulkuisin/selkein reitti
  - nopein reitti/ruuhkattomin reitti (myös mahdolliset onnettomuudet)
  - lyhin reitti
3. Matkan pituus kilometreissä
4. Arvio ajoajasta
  - olosuhteet huomioon ottava arvio
  - perille saapumisaika
  - Arvio matka-ajasta -> lähtöaika kotoa
5. Liikenteen määrä/ruuhkaisuus tietyllä välillä
  - milloin kannattaa herätä/lähteä, ettei joudu ruuhkiin (illalla nukkumaan mennessä)
  - ruuhkatilanne noin tunnin päästä (herätessä)
  - onkohan tietty tieosuus jo ruuhkainen (aamulla kotona tai matkalla)
6. Onko autossa vikaa?
  - Miksi merkkivalo palaa?
  - Mistä saa apua, kun auto ei käynnisty?
7. *hint* (*bensan hinta eri asemilla matkan varrella*)
  - *Missä tietyllä välillä on halvinta bensa?*
  - *bensan hinta eri asemilla*
  - *Miten paljon auton ruostehuollosta kannattaa maksaa?/eri huoltamoiden hintavertailu*
8. *sää/keli`*
  - *minkälainen sää on tänään*
  - *keliolot matkalla/tietyllä välillä*
  - *pahat kohdat/kelirikot*
  - *keliolot aamulla/päivällä/illalla - muuttuuko keli päivän kuluessa?*
  - *lämpötila*
  - *tien lämpötila*
  - *tien liukkaus*
  - *vesi*
  - *näkyvyys/tiheä lumisade - kuinka pitkälle jatkuu?*
  - *Onko keli sellainen, että on turvallista käyttää vakionopeudensäädintä?*
9. auton lämpötila - milloin auto on sopivan lämmin (aamulla kotona)
10. Mistä löytyy parkkipaikka
  - lähellä
  - kohtuuhinnalla
  - Onko parkkihallissa tilaa?
11. Sallitut nopeudet eri tieosuuksilla tietyllä välillä
12. Radiossa...
  - soitetun kappaleen nimi/esittäjä
  - haastatellun henkilön nimi
13. Tauot
  - Mahdollisten taukopaikkojen sijainti.
  - Mikä on tietyt ehdot täyttävä (tien varressa, noin matkan puolivälissä, hyvä kahvila ja bensa-asema, josta saa bensa luottokortilla) sopiva taukopaikka?
  - Taukoihin varattava aika?
14. Muistutus paikasta, jossa tulisi poiketa/pysähtyä, ennen kuin on ajanut sen ohi

## Appendix 3

### Travelling by public transport

(seuraavassa bussi tarkoittaa linja-autoa, raitiovaunua yms.)

1. bussin saapumis-/lähtöaika pysäkiltä
  - milloin bussi starttaa pääte pysäkiltä
  - bussin lähtöajat
2. matkan kesto
3. bussin saapumisaika tietyille pysäkeille
  - Koska seuraava bussi tulee?
  - Hälytys, joka voidaan asettaa esim. 5 minuuttia ennen kuin bussi saapuu kotipysäkeille tai kun bussi on jollain tietyllä edellisellä pysäkillä.
  - Kuinka paljon bussi on myöhässä?
  - Koska tulee seuraava bussi x?
4. seuraavan bussin numero
  - Mikä bussi tulee seuraavaksi?
5. *hint*
  - *bussilipun hinta*
  - *Kumpi tulee käytössä kannattavammaksi, matka- vai näyttökortti?*
6. *sää*
  - *Sataako, kun lähden? (Jos sataa, odotan bussia, jos ei kävelen)*
  - *Tieto seuraavan päivän säästä (henkilöauto/joukkoliikenne)*
7. bussiaikataulu
  - tietyille välille
  - tiettyinä viikonpäivinä
  - tiettyjen linjojen aikataulut
  - yleisesti
8. missä pysäkki sijaitsee/miltä pysäkiltä/laiturilta bussi ym. lähtee?
  - Missä tietty bussi pysähtyy?
9. Reitinoptimointi tiettyjen paikkojen välille (nopeus, lyhyet kävelymatkat)
  - Mikä kulkumuoto/kulkumuodot?
  - mikä bussi/bussit?
  - milloin lähtö?
  - missä vaihto/vaihdot?
  - tavoitteena olla tiettyinä kellonaikana perillä
10. Millä busseilla pääsee määräpäähän?
11. Mitkä ovat seuraavat mahdolliset yhteydet määräpaikkaan?
  - eri liikennevälineet
  - lähtöpaikat
  - lähtöajat
12. kätevin vaihtopysäkki tiettyjen kahden linjan välillä.
13. Millä pysäkillä jään pois?
  - Mikä on määräpaikkaa lähin pysäkki?
14. Mistä voi ostaa lipun?
  - kartta, jossa lähimmät myyntipisteet
15. Linja-autoaseman aukioloaika
  - Onko asema tällä hetkellä auki?

## Appendix 4

### Shopping

1. Mitä tarvitsee ostaa kotiin?
  - kauppalista
  - Mitä jääkaapissa on ja mitä sieltä puuttuu?
2. Mistä kaupasta/kaupoista voi ostaa halutun tuotteen?
  - Onko tiettyä tuotetta/palvelua saatavissa tietystä kaupasta?
  - Onko samaa tuotetta myynnissä jossain toisessa kaupassa?
3. Aukioloajat
  - tietyn liikkeen aukioloajat
  - Onko tietty liike tiettyyn aikaan auki?
4. Erikoistarjoukset
  - tiettyssä liikkeessä
  - eri liikkeissä
5. *Hinta*
  - *tietyn tuotteen hinta tietyissä kaupassa tai yleisesti*
  - *Mitä muut vastaavat tuotteet maksavat?*
  - *tuotteen hinta eri kaupoissa/edullisin ostopaikka tietyille tuotteille*
  - *Mikä tuotevaihtoehtoista tulee omassa käytössä edullisimmaksi?*
  - *Euro/markkamuuunnos*
  - *sopiva myyntihinta tietyille tuotteille*
6. Tietoa tuotteesta
  - tuotteen sisältö
  - Soveltuuko tuote tietynlaiseen käyttöön?
  - asennus-/käyttöohjeet
7. Tuotteen sijainti kaupassa
8. Mitä jossain tietyissä kaupassa on myynnissä?
9. Voiko tuotteen palauttaa/vaihtaa?
  - Minne palautetaan?
  - Saako rahaa takaisin?
10. Toimitusaika
11. Kuljetus
12. Onko joku uusi tuote jo ilmestynyt markkinoille?
13. Mitä kauppoja on tietyn reitin varrella?
14. Henkilöiden lukumäärä liikkeessä, onko jonoja?
15. Missä tiettyä tuotetta myyvä liike sijaitsee?
16. Minkä kokoisissa pakkauksissa tiettyä tuotetta on saatavissa?
17. Tietyn kaupan tietyn tuotteen parasta ennen -päiväys/tuoreus.

## Appendix 5

### Weather and road conditions

1. Liukkaus
  - Mistä ja mihin hintaan saa kenkien liukuesteit?
  - vähiten liukas reitti
  - Ovatko tiet jäässä? (kenkien valinta)
  - Onko vettä/lunta jään päällä? (kenkien valinta)
2. Keliolot automatkalla
  - keliolot matkalla/tietyllä välillä
  - pahat kohdat/kelirikot
  - keliolot aamulla/päivällä/illalla - muuttuuko keli päivän kuluessa?
  - lämpötila
  - tien lämpötila
  - tien liukkaus
  - vesi
  - näkyvyys/tiheä lumisade - kuinka pitkälle jatkuu?
  - Onko keli sellainen, että on turvallista käyttää vakionopeudensäädintä?
3. Sääennuste
  - seuraavan päivän sää (kulkumuodon valinta)
  - päivän sää
  - loppupäivän sää
4. Miten sääolot kehittyvät päivän mittaan?
  - aamulla/päivällä/illalla
  - Kuinka kylmää/märkää ilmaa on luvassa iltapäiväksi?
  - Kylmeneekö?
  - Alkaako sataa (voiko jättää matot ulos)
  - sää/tuuli merellä yön aikana
5. Paikallinen sääennuste tiettyyn paikkaan
  - tietty kaupunki
  - jäällä (pilkkimään lähtiessä pukeutuminen)
6. Lämpötila eri paikoissa
  - Paljonko saunassa on lämmintä?
  - auton lämpötila - milloin auto on sopivan lämmin (aamulla kotona)
  - Suihkuveden lämpötila
  - Työpaikan lämpötila (aamutoimien yhteydessä pukeutumisen kannalta)
7. Ulkona vallitseva sää
  - sade: lumi/vesi (tarvitaanko sateenvarjoa/voiko matot jättää ulos?)
  - lämpötila (pukeutuminen)
  - tuuli
8. Tietyn paikan keli
  - onko jäällä hiihtokeli vai sohjo (kävely vai hiihto)
  - Missä kunnossa on tietyn luistelukentän jää?
  - Missä on lähin luistelukunnossa oleva kenttä?
  - Onko hiihtokeli?
  - Onko Paloheinässä hiihtokeli?
9. Ulkomaan sää
  - Sää tietyissä maissa/kaupungeissa (mitä pakkaa matkalle mukaan?)
10. Muuta
  - Onko sää sellainen, että pölypunkit kuolevat ulkona tuulettumassa olevista petivaatteista?
  - Voiko matot viedä ulos lumisateessa ja pakkasessa?

## Appendix 6

### Situation somewhere else

1. Kuinka paljon jossain on ihmisiä?
  - tien ruuhkaisuus
  - parkkihallin täyttöaste
  - aamiaishuoneen täyttöaste (laivalla/hotellissa)
  - Onko vapaata omaa pöytää kahdelle henkilölle?
  - Paljonko laivan ravintoloissa on ihmisiä?
  - Onko lentokentällä paljon ihmisiä tsekkaamassa tietyn lentoyhtiön lennolle?
  - Onko tietyssä liikkeessä paljon ihmisiä (koska kannattaa mennä ostoksille)?
  - Onko kaupassa/pankkiautomaatilla/apteekissa jonoa?
  - Onko saunastolla tilaa/saunassa tilaa vielä kahdelle?
2. Ihmismäärän ennakointi
  - tien ruuhkaisuus noin tunnin päästä
  - Koska asiakasruuhka alkaa?

### Locating a person

3. Henkilön paikannus
  - Missä kohdalla tiettyä reittiä lapsi on kyseisellä hetkellä?
  - Löytääkö/pääseekö (saako ovet auki yms.) lapsi yksin perille?
  - Missä henkilö on?
  - Missä huoneessa henkilö on?
  - Missä henkilö on määritellyn alueen sisällä?
4. Onko henkilö määritellyllä alueella?
  - Odottaako lapsi sovitussa paikassa?
  - Tieto tietyn henkilön saapumisesta tiettyyn paikkaan (kotiin/töihin ym.)
  - Onko tietty henkilö tietyssä paikassa (esim. työpaikalla/hotellissa/kotona)?
  - Ovatko tarhalapset ulkoilemassa?
  - Ovatko kaverit jo paikalla?
  - Onko samassa junassa kollegoja ja missä he ovat?
  - Ketkä ovat paikalla (esim. työpaikalla)?
  - Onko henkilö vastassa rautatieasemalla ja missä hän on?
5. Henkilön ”tila”
  - Odottaako lapsi kärsimättömänä?
  - Koska lapsi herää autossa?
6. Mitä jossain muualla parhaillaan tehdään?
  - Miten lapset pärjäävät keskenään kotona, mitä tekevät?
  - Mitä talonrakennuksessa tehdään parhaillaan?
7. Henkilön ominaisuudet
  - Minkälainen laivan kapteeni on?

## Appendix 7

### Service ideas

#### *Finding things at home*

“Haluaisin, että kehitettäisiin sellainen järjestelmä, jonka avulla voisi löytää kadonneita esineitä esimerkiksi kotona. Ainakin minulla menee päivittäin liikaa aikaa ja hermoja sellaisten tavaroiden, esineiden, laitteiden, lelujen, asiapapereiden (passi!, VISA-kortti, kuukausilippu) yms. etsimiseen, joista varmasti tiedän, että meillä sellainen on mutta missä. Ainakin näin isossa perheessä esineiden dematerialisoituminen on tosiasia, jonka välttäminen tuntuu mahdottomalta. Tässä luonnos minulle sopivasta systeemistä:

Jokainen (tai ainakin tärkeimmät?) kotiin tuotu kappale varustettaisiin jollain merkinnällä (sähköisellä koodilla?) jo heti vaikka eteisessä. Samalla kappaleen ulkonäkö dokumentoitaisiin ja koko tietopaketti siirtyisi tietovarastoon, joka olisi vaikkapa tietsikka, kännykkä tai muu sellainen helppokäyttöinen, pieni, mukaan otettava vekotin. Kappaleiden merkintä voitaisiin tehdä jollain kynää muistuttavalla, yksinkertaisella laitteella; pieni kosketus kappaleeseen riittäisi (ei mitään hitaita skannauksia tai valokuvauksia). Ja ihme ja kumma! Kun jokin esine on hukassa, ei tarvitsisi muuta kuin näpytellä, selata tai muuten yksilöidä haluttu esine vekottimesta ja jostain kotoa alkaisi kuulua tietynlaista piipitystä tai muuta merkkiääntä, jota kohti mentyä kaivattu esine löytyisi. Yksinkertaista, vai mitä!

Tiedonhakusysteemi olisi laadittava mahdollisimman monipuoliseksi; esim. esineet tulisi jaotella ulkonäkönsä, käyttötarkoituksensa, arvonsa tms. mukaan luokkiin jo merkintävaiheessa (vaikka useampaan luokkaan samanaikaisesti). Ts. jos vaikkapa etsisi jotain lelua lapsen pyynnöstä eikä tietäisi tarkalleen, mitä lelua lapsi tarkoittaa, voisi valikoiden kautta seuloa lelua vaikkapa ensin yleensä leluista, sitten eriyttäen pehmoleluista, sitten pehmoeläimistä, sitten vaikkapa värin mukaan ja lopulta tarjolla olisi sen verran suppea valikoima yksilöityjä leluja, että niiden kuvallinen läpikäyminen ei veisi mahdottomasti aikaa. Ja lapsi voisi sitten vaikka sormella osoittaa näytöltä, että juuri tuotoa otusta hän kaipaa. Ainakin meidän perheessä vältyttäisiin massiivisilta etsintäoperaatioilta ja rauha ynnä sopusointu vallitsisivat...

Ja ajatella, miten helppoa olisi lähteä vaikka Tallinnaan pistäytymään, kun näpyttelisi vain sanan PASSI ja heti passi vinkuisi jossain laatikonpohjalla.

Voi olla, että perheemme sekasorto ei ole tyypillistä mutta totta tosiaan olisin valmis sijoittamaan erinäiset määrät rahaa tällaisen systeemin hankkimiseen ja ylläpitoon. Rakkaat tutkijat ja tuotekehittelijät! Keksikää meille dematerialisoituneiden kappaleiden etsintäyksikkö!”

#### *Planning the next week's meals*

“Asetan pysyviä reunaehdoja (allergia tai haluttomuus käyttää tiettyjä ruoka-aineita tai tuotteita) ja mieltymyksiä (terveellisyys) ja syötän aineet, jotka haluan käyttää (Jääkaapissa on raaka-aineita, joiden viim. käyttöpäivä lähestyy). Laite tarkastaa lähikaupan tarjoukset ja ehdottaa reseptejä joista valitsen jonkun ja saan ostoslistan laitteelta.”

## Appendix 8

### Group-specific results

#### Group-specific results – critical theme-based groups

##### 1. Memory disordered group -Alzheimer

###### Respondents

In this group, there were two female and two male participants. All of the participants were under 70 years of age and they were in the early stage of Alzheimer's disease<sup>15</sup>. All of them lived in their own home, three of them with their spouses and one by herself. One respondent was still driving his car, two were using public transport and one respondent had a taxi card provided by the city. The participants were familiar with each other, since this group was formed from a weekly meeting activity group that is organised by the Helsinki Alzheimer Association<sup>16</sup>.

###### Summary of results

The focus in this group meeting was information needs in everyday travelling, usually in familiar environment. However, Alzheimer's causes memory "black outs", where even in a familiar environment the person may lose track of their current location, route or point of destination. In addition to information needs related to travelling, the group discussed information needs when shopping and the concerns and information needs of their relatives related to the participants' wellbeing.

When planning a trip to an unfamiliar place, the information needs were related to finding the location and finding out the possible routes to this destination. In the next step, the information needs were mainly related to remembering the event and articles to take for the journey and finding different articles (keys, tickets etc.) when leaving home. Also remembering to tell relatives about the trip and locking the door were indicated as concerns. After leaving home (on-trip), the concerns were remembering the final destination and keeping to the planned route. The information needs related to travelling by public transport were selecting the correct stop, remembering and stopping the correct bus line, getting off at the correct stop and finding the direction from the stop to the final destination. The information needs during the final part of the trip, getting back home, were similar to the "on-trip event" information needs. Those information needs were mainly related to finding the car or the correct stop and finding the route back home (detailed guidance direction).

Information needs when shopping were usually related to finding products, relatives or exits inside the store or shopping centre. Also reminding about weighing the vegetables etc. and forgetting one's wallet when leaving the shop were mentioned as concerns. Participants were also interested to know if there are a lot of people in the store and wanted to avoid these very

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<sup>15</sup> Two of the participants were still living rather independently and did not have relatives with them all the time when travelling. Two of the participants hesitated already a little bit to travel alone and especially one of the participants did not travel without an escort (taxi driver etc.) anymore. However, all of the participants walked some short trips without an escort.

<sup>16</sup> Alzheimer ry is a private organization that is funded by collected funds, private donations and public funds mainly from cities in the Helsinki area.

congested times if possible. The participants indicated that many times, their relatives were more concerned about their wellbeing than they were themselves.

The participants said they tried to remember to tell their relatives about their travel plans, but if they forgot or if the plans changed, it would be useful for the relative to know where the participant is and what alternative travel plans the participant has. However, the ethical issues were highlighted in this part of the discussion. The feeling of someone monitoring the participant all the time would probably not be accepted without any reservations. However, the respondents emphasised that many times, relatives get more worried about the unexpected situations than the participants themselves. The challenge for a service provider is to design a service that makes these users less dependent on others and guide them home (or to another destination) in case they get lost. However, the service should not make them feel as if they are being monitored by their relatives all the time (especially in the early phase of the illness). Some other information needs listed by respondents (locating one's belongings, route guidance, information needs when shopping etc.) were similar to information needs listed by typical user groups. These respondents just needed the same information also in familiar environments and reminding was an important need.

## **2. Visually impaired group**

### **Introduction**

Visually impaired and elderly persons can have bigger problems when travelling independently than many others. They do not have the means to access the information they need to plan their journeys, know their location and keep to a planned route. In the MoBIC (1997) report, the general needs of visually impaired people when on the move are listed as follows:

- users current location, including direction currently travelling
- directions to destination (including number of turns, distances etc.)
- lay-out of the environment (grading of roads, pavement surfaces, ramps, one way streets...)
- street information including number of buildings
- roadworks
- street furniture
- pedestrian crossings
- useful items on the street (e.g. post-boxes)
- useful buildings and landmarks

More information can be found at <http://simsrv.cs.uni-magdeburg.de/~mobic/paperuk.html>

### **Respondents**

In this group, there were three female and two male participants. The participants were between 20 and 58 years of age and all of them lived in the Helsinki area. Four participants were blind and one had lowered visual ability. All of them used public transport in their everyday travelling. The bus was the most frequently used public transport vehicle, but also the train and the underground were used almost daily by at least one participant. Over all, the participants were quite active in the use of public transport services in the Helsinki area, but also when travelling longer trips.

### **Summary of results**

The focus in this group meeting was to uncover information needs while travelling by public transport both in familiar and unfamiliar environments. When planning a trip by public trans-

port, the main information needs were related to selecting a suitable transport mode and line. When selecting the best or most suitable mode, line or stop there were different criteria mentioned in the discussion. Some of these criteria were the easiest or most familiar access to the stop or to the vehicle, the closest stop to the final destination, a safe and convenient route from the stop to the final destination or individual help given by the operators. In addition information such as where the selected stop was and how it can be found, what time that selected vehicle is at the stop and what is the best stop to get off were mentioned to be necessary when planning the trip.

The information needs when travelling to the stop and at the stop are somewhat different from other user groups. Because of their reduced vision or blindness, the participants indicated the need for quite detailed information about the surrounding and their location in this surrounding. Especially information about dynamic changes in the infrastructure (things that are changing rapidly) was indicated by the participants to cause problems, stress and even danger to their safety. Another strong need for new solutions was when trying to stop the correct vehicle at the stop. One of the participants proposed the development of an electrical stopping system similar to the buttons inside the vehicles at the moment for stopping the vehicle at the correct stop. With this less noticeable electronic device, visually impaired people could give information to the drivers about the number(s) of the vehicle she/he wants to get on and vice versa, get information about the approaching vehicle and a more detailed location of this vehicle. Especially with trains, but also larger travel terminals, finding the correct platform can be rather difficult, especially if there are some last minute changes to the platforms indicated in the time schedules. Also finding the correct railway carriage and correct seat had caused some problems to the participants.

When travelling in the public transport vehicle, the main questions were related to paying the fare, getting off at the correct stop, finding the push-buttons for the stop sign or door opening and finding the way out especially in situations where the journey is short. Although blind travellers are entitled to use free passes when travelling in the Helsinki area (Väänänen, 2002), participants expressed concerns about the use of electronic tickets. More automated systems might cause a number of problems to older people and especially to people with reduced vision. Getting off at the correct stop was another issue that was discussed in this group. Some of the participants had been on a bus or tram in the Helsinki area, where the name of the next stop is announced automatically. This service was found to be very good, and extending this system to all transport vehicles was desirable. Getting off from the vehicle can cause some problems as well. Finding the stop button can be difficult and informing the drivers about slowly moving passengers was mentioned to be problematic at the moment. When travelling from the stop to the final destination, the problems and information needs were very similar to the situation when travelling to the stop. Participants mentioned as detailed problems finding the way out from a larger terminal, especially when they are not on ground level. Also a very relevant information need was detailed guidance to the final destination.

Almost all listed information was rated as “cannot do the trip by public transport without this information”. In other words, the participants were not asking for luxury information services but just for information that they need to be able to do the trip safely.

### **3. Physically disabled group**

#### **Respondents**

In this group, there were four female and two male participants. The participants were between 32 and 58 years of age and all of them lived in the Helsinki area. Four participants moved with a wheel chair and two had a physical disability that somewhat hindered their ability to move. Three of the participants were working daily and the other three were quite active in voluntary work in different organisations. Three of the participants had a driver's license and had driven during the last year. The frequency of using public transport varied quite a lot between the participants: two of the participants used the bus or underground daily, two of them used the train or underground weekly and two of them used public transport less than monthly or only a few times a year. The underground, buses and trams were the most frequently used public transport vehicles in this group, although trains were also used.

#### **Summary of results**

The focus in this group meeting was information needs while travelling by public transport in a familiar environment. Most information needs in this group were related to unobstructed route. The most important concern to these participants was information about construction features on their route (streets, stops, terminals, vehicles etc.) that made their moving impossible. The participants emphasised that this information needs to be real-time, since the information is crucial and unforeseen changes to this information might make the trip impossible even once they have left home. If this information is missing, the decision to make the trip by public transport is too risky to take and therefore often other modes of transport are selected.

When planning a trip by public transport, the main questions were 1) which transport mode, line and shift is best suitable, 2) what are the construction features of the stops, 3) has there been any changes to the time schedule of low-floor vehicles, 4) what time is the selected (low-floor) vehicle at the stop and 4) what is the condition of the streets and roads (winter maintenance) or what is the planned schedule for winter maintenance, for example ploughing the route for snow. Usually this information was crucial when deciding whether to make the trip. The participants emphasised that it is very important to have real-time information about unobstructed route (low-floor vehicles etc.), since halting the trip is sometimes the only option left to them if the trip conditions change.

Guidance in large terminals (location of elevators, slides etc.) and information regarding when the next low-floor vehicle is due (real-time information) was indicated to be important while getting to the stop and waiting for the vehicle. When travelling by train, finding the correct railway carriage and correct seat had caused some problems to the participants. The information about the location of a specific railway carriage would help them wait at the correct place.

When travelling by public transport vehicle, the main questions were related to paying the fare, moving inside the vehicle and finding the way out, especially in situations where the journey is short. Getting on and off the vehicle can cause some problems. The pre-information about the existence and availability of special places reserved for wheel chairs and prams would be important especially when travelling on a long headway transport line. When wanting to get off the vehicle, reaching the stop button might be difficult. The group also discussed the special "slowly moving passenger" stop button that was available at least in some buses. Not all participants were aware of this function, but all of them considered the function useful. This would be very useful to travellers with a more imperceptible physical disability.

When travelling from the stop to the final destinations, the problems and information needs were very similar to the situation of travelling to the stop. Participants listed for example information needs concerning the unobstructed way out from stations or larger terminals, espe-

cially if they were not on ground level. Also, a very relevant information need was information about the route to the final destination (elevators, differences in level etc.). However, as mentioned earlier, because this information is crucial when considering the ability to do the trip, it is needed at the point of making the decision about the ability to do the trip by public transport and planning the trip. In addition to information related to travelling by public transport, the information about the conditions of walkways (winter maintenance and road works) would be useful also when using other modes of transport as well. Also having guidance about the best and unobstructed route to the destination would ease the everyday moving of people with physical disabilities.

Almost all listed information was rated as “cannot make the trip by public transport without this information”. In other words, the participants were not asking for luxury information services but just for information that is crucial for them to be able to plan and make the intended trip without uncertainties regarding potential major problems during the trip. In addition to information related to travelling by public transport, information about the conditions of walkways (winter maintenance and road works) would be useful when travelling by other modes of transport as well. Also having guidance about the best and unobstructed route to the destination would ease the everyday moving of people with physical disabilities.

## **Group-specific results – theme-based groups**

### **4. Young respondents - students**

#### **Respondents**

In this group, there were three female and three male participants. All of the participants were under 30 years of age (22 - 28) and were students. All of the participants spent time in unfamiliar environments at least once a month. All these participants had a mobile phone.

#### **Summary of results**

The group discussed information needs when shopping and when attending a festival or a fair. After the discussion about information needs in these situations, the group participants were told about a technology that would enable locating either static (buildings etc.) or dynamic (moving) objects and provide this information to the users. The participants were asked to consider possible service ideas that would use this ability of locating objects.

#### **Shopping**

The information needs related to shopping were 1) finding a product or product group, 2) finding information about a selected product, 3) finding services and 4) information about sales. Participants indicated that information about the location of a product or product group was needed differently in different situations. Basic information could include information about the shops and the location where products could be found, but sometimes also guidance to the shop. In a large shop, information on the location of products might be useful even when inside the shop. When already inside the selected shop, more detailed information might be needed about selected products. This information might be related to the materials used, care instructions or guarantee. Information about the location of specified services (restaurant, café, shop etc.) and information about payment methods in the shop were indicated to be important especially if shopping in an unfamiliar area. Information about sales was either related to when is the sale due to start or information to special offers at a selected shop.

### Festivals and exhibitions

The group was also asked to consider their information needs while at festivals, fairs or exhibitions. The information needs related to planning were 1) information related to staying overnight (possibilities, prices, location etc.), 2) information related to travelling to the event (both by car and public transport) and 3) information about services and payment methods in the area. Participants emphasised the importance of information related to travelling: possible modes, lines and shift, guidance about the correct stop to get off at and guidance from the stop to the final destination as well as information about parking possibilities if travelling by car.

When arriving in the event area, a map including information about the location of different services was indicated to be the most important information. However, additional information about queues in those services, or menus and prices was indicated to be useful sometimes as well. Information about the specific location and starting time of different events were indicated to be important, especially if there were changes to the announced schedule. When looking for friend at large festivals or other events, information about their location (such as a map showing the location of the friends or the agreed meeting place) might sometimes be useful.

### Possible services enabled by location technology

The ideas of possible service solutions for this technology were related to 1) locating people, 2) locating other moving objects (vehicles, animals etc.) or 3) using the users' location when locating services or giving guidance. Also the possibility to pay through a portable device (such as a mobile phone) was seen to be very useful.

When locating people, the possible service ideas were mainly related to special groups or special situations. The most commonly accepted use of location was with prisoners when moving outside the prison, or demented patients. Also, locating a person that is possibly in danger (getting lost, accident etc.) was widely accepted by the group. The participants emphasised that a person should always be able to refuse being located and especially refuse that this information be transmitted to someone else. It was seen to be more acceptable if the locating was subject to the person's own request. The concerns were related to the actual benefit of these services and the risk of increased surveillance by the authorities. On the other hand, the participants indicated that the services should be provided to typical mobile phones or other common portable devices (device-independent). Service ideas locating other moving objects were mainly related to locating public transport vehicles and providing real-time information to travellers based on this location information. Locating one's own vehicle could be used if it was stolen or if the owner had forgotten where she/he had parked it. Also locating animals, for example hunting dogs, might be a useful service for some people. Listed service ideas that were using the user's location information were often related to travelling in an unfamiliar environment and therefore guidance as part of the service was seen to be important. Additional information related to service location was services' business hours, prices and special offers. Also guidance (map) that has street names and buildings and the user's own location was indicated to be useful.

## **5. Young respondents - teenagers**

### **Respondents**

In this group, there was four 17 year-old males who attended the same school, were in the same class and spent most of their free time together as well. Most of their trips were done either by bicycle or by foot, but all of them used public transport almost daily. All of the participants had a mobile phone.

## Summary of results

The group discussed information needs when spending time in an unfamiliar city or at festivals or at an exhibition. After the discussion about information needs in these situations, the group participants were told about a technology that would enable locating either static (buildings etc.) or dynamic (moving objects) objects and provide this information to the users. The participants were asked to consider possible service ideas that would use this possibility to locate objects.

### *Spending time in an unfamiliar city*

The information needs when planning the trip were related to money (exchange rate of foreign currency, estimation of price level in a particular country etc.) and the country's culture and customs when travelling abroad. Also information about the different possibilities to travel to the destination (modes, travel duration, price etc.) were indicated to be important.

When spending time in an unfamiliar city, a map of the city (or the areas' ski slopes) was indicated to be the most important information. Additional information about restaurants, agreed meeting places (when travelling with a larger group) and places where bicycles or cars can be hired were indicated to be important sometimes. Additional information about menus and prices would help the user select the service either nearest to her/him or least expensive. In special emergency cases, information about the location of the nearest hospital, pharmacy, police station or the Finnish consulate would be useful. It would be useful to have information about the location of attractions or places for leisure activities (beaches, football pitches etc.) included on the map as well. For tourists, information about available tours (destination, prices etc.) could be useful. When travelling abroad, a dictionary was seen to be very useful.

Guidance to a selected destination (attraction, hotel etc.) including the trip duration was indicated to be important when spending time in an unfamiliar environment. Also information about public transport would be useful. Route optimisation (best mode and line) was stated to be important, but also guidance to the stops was seen to be useful. In addition, information about the trip duration and prices was indicated to be important.

### *Festivals and exhibitions*

At festivals, information about the performers (where and what time) was stated to be important. One participant indicated that a real-time reminder of the starting-time of a selected performer and the location of the stage would be useful in larger festivals. The location of a number of services (restaurant, café, toilets, lockers etc.) was indicated to be important as well. Information about the location of friends was stated to be important, since meeting in large festival areas can sometimes be difficult.

### *Possible services enabled by location technology*

The ideas of possible service solutions for this technology were related to locating people or using the users' location when locating services or giving guidance. Also, the possibility to pay through a portable device (such as a mobile phone) was seen to be very useful.

When locating people, the possible service ideas were mainly related to locating friends or groups members when, for example, travelling with a larger group. Locating friends might be useful if trying to find a friend in a large area (football game or some other event) or it could be used to find out if someone from a particular group has already arrived at a specific area (school, event etc.). The information could also be used when planning whom the person might call and suggest going to see a movie etc. (for example during the summer holidays information about who is in town). When spending time in an unfamiliar city, it would be

useful to know your own location and possibly even have a map where your own location is shown. When locating services (shops, restaurants, movies etc.), information about the closest or the cheapest one was seen as a useful selection criteria.

Also, the possibility to pay through a portable device (such as a mobile phone) was seen to be very useful. The portable device could be used as a bank card: the user could deposit some money into the “mobile phone account” and then use it in shops or when paying for other articles with the portable device. Articles and services that were listed in the group discussion were movie tickets (booking and paying), train or bus tickets, candy machines and petrol.

## **Group-specific results – situation groups**

### **6. Daily travelling by public transport – technology students**

#### **Respondents**

In this group, there were four female and two male participants. All the participants were under 25 years of age and were students at Helsinki University of Technology. They travelled daily by public transport, mainly by bus, but also by train. Some of the participants used trams or the underground at least weekly. All of the participants had a mobile phone.

#### **Summary of results**

The focus in this group meeting was information needs in everyday travelling by public transport. However, unfamiliar environments were also discussed at some point of the discussion. In addition to information needs related to travelling by public transport, the group discussed information needs when shopping.

#### *Travelling daily by public transport*

When planning a daily trip by public transport, the information needs were 1) what time (real-time information) the vehicle arrives at the stop, 2) what time (real-time information) the vehicle arrives at the destination stop and 3) how long does it take to walk to the stop (what time one should leave home etc.). The most valued information to most of the participants was information (forecast) about the time of arrival to the destination stop. However, real-time information about the real location of a selected vehicle or real-time information about the vehicle stop time (at the beginning of the trip) was indicated to be very important as well, since it would help them optimise the time at which they have to leave for the stop. This information could also provide more detailed information in case of congestion or a traffic accident, where delays can be quite long. When travelling in an unfamiliar environment, a description of the possible routes would help the participant decide which route would be most suitable to her/him. This could also be done by a route-optimisation service that lets the user select the criteria that the route selection was made (fastest trip, shortest trip, trip with least transfers or shortest walking distances).

Most of the information needed when travelling to the stop or waiting at the stop was similar to the information needed when planning the trip. Real-time information about the stop time was indicated to be useful at the stop as well. In addition, information about the possible lines that go to the final destination would be useful, especially when travelling in an unfamiliar environment. Information about possible alternative routes or lines would be useful in a situation, where the plans have changed (missing the planned vehicle, congestion or other delays, special occasion etc.).

The information needs when travelling inside the vehicle were mainly related to updated information about the real-time stop times for all the stops left or the estimated departure time to one's own destination stop. Also guidance information when changing vehicles or mode of transport was indicated to be important especially in large terminals or when the time to transfer to another vehicle is very short. This information might include for example real-time stop times for both vehicles and guidance to the correct transfer stop. In unfamiliar environments, the most important information was usually related to getting off at the correct stop. When travelling from the stop to the final destinations, the information needs were usually related to travelling in an unfamiliar environment. It would be useful to have some kind of guidance at the stop, for example a map with the most relevant buildings or street names.

The most important information was real-time stop time, guidance at the correct stop (when getting off) and guidance to the correct stop. Also a list of stops and stop times was selected more often to be one of the three most important information. According to the participants, the most frequently used information would be real-time stop time, paper schedules and line maps and real-time destination stop time.

### *Shopping*

After the discussion about daily travelling by public transport, the group was asked to consider their information needs while shopping or moving in large shopping centres or shops. The information needs related to shopping were 1) finding a product or product group, 2) finding services and 3) information about sales.

Participants indicated that information about the location of a product or product group was needed differently in different situations. Basic information could include information about the shops (and their location) that had the specified product. This was specially the case with special products that might be hard to find. Additional parameters such as the lowest price or a specific size might also be added as a selection criteria. When already inside the selected shop, more detailed information might be needed about the specific location of the product. With special products (seasoning, ingredients for baking, fruitage etc.), the information might be useful if the participant does not know what the product looks like.

Finding services included information needs about the nearest restaurants, cafes, lockers, toilets and automatic cash dispensers. Additional information (menus and prices of selected restaurants) was indicated to be useful sometimes. Also information about the business hours or congested hours of different shops or services were seen to be useful. Information about sales was related either to the starting date of the sale or to special offers at a selected shop.

## **7. Daily travelling by public transport**

### **Respondents**

In this group, there were four female and three male participants. The participants were aged between 24 and 57. Four of them had a driver's license and three had the possibility to use a car every now and then. All participants travelled daily trips by public transport, mainly by bus, but also by train, trams and the underground. Overall, the participants used different modes of public transport very frequently. Five of the participants had a mobile phone.

### **Summary of results**

The focus in this group meeting was information needs in everyday travelling by public transport. However, unfamiliar environments were also discussed at some point of the discussion. In addition to information needs related to travelling by public transport, the group discussed the possible services that would be enabled by location technology.

### Daily travelling by public transport

When planning a daily trip by public transport, the information needs were 1) what time (real-time information) the vehicle arrives at the stop and 2) what time (real-time information) the vehicle arrives at the destination stop. Overall, the time schedule (both the traditional paper version, but also the Internet service) was stated to be very important when planning the trips. Information about the real-time stop time both at the starting and ending stops was indicated to be very important as well. Participants emphasised that the information would be more useful if also unexpected incidents such as congestion or accidents could be taken into account. When travelling in an unfamiliar environment, information about different possibilities to make the trip and information about the best possibility (route optimisation) was mentioned to be important when planning the trip. Also guidance to the correct stop or platform was seen to be important information.

Most of the information needed when travelling to the stop or waiting at the stop was similar to information needed when planning the trip. Real-time information about the stop time was indicated to be useful at the stop as well. The use of large displays presenting this information in terminals or station was seen to be useful. The participants emphasised that information about delays and especially the cause of the delay would be useful when waiting for the vehicle. In addition, information about the possible lines going to the final destination would be useful, especially when travelling in an unfamiliar environment or in case of missing the vehicle or another similar event where re-routing of the trip might be needed.

The information need when travelling inside the vehicle were mainly related to getting off at the correct stop. Line maps with information regarding the current location of the vehicle or announcements about the next stop (name of the stop and/or street) were seen helpful in these situations. Also a reminder telling the participant when she/he is approaching the correct (selected) stop was seen to be useful. Also information (real-time stop time for both vehicles, guidance to the correct transfer stop etc.) when changing vehicles or mode of transport was indicated to be important, especially in large terminals or when the time available to transfer to another vehicle is very short. This information about the location and forecasted stop time for selected two vehicles would also help the participant ensure that the planned transfer to another mode, line or vehicle is still possible to make. Updated information about the real-time stop times for all the stops left would be useful when trying to estimate the arrival time to their desired destination stop. Also information about special incidents (accidents, congestion) and possible alternative routes or lines was stated to be important.

When travelling from the stop to the final destinations, the information needs were usually related to travelling in an unfamiliar environment. It would be useful to have some kind of guidance at the stop, for example a map with the most relevant buildings or street names or at least guidance about the directions of the nearest suburbs (arrow “Kilo ½ km” etc.).

The most important information was real-time stop time, paper time schedules and estimated stop times. Also real-time destination stop time (forecast) was selected more often to be one of the three most important information. According to the participants, the most frequently used information would be estimated stop times, real-time stop times (start and destination stops) and paper time schedules. Also information about incidents was seen to be important, but would probably be relevant less frequently than daily.

### Possible services enabled by location technology

The ideas of possible service solutions for this technology were related to 1) locating people, 2) locating other moving objects (vehicles, animals etc.) or 3) locating services (and using the users' location as one criteria). When locating people, the possible service ideas were mainly

related to special groups or special situations. The most commonly accepted use of location was with prisoners when moving outside the prison, or mentally ill or demented patients. Also locating a person that is possibly in danger (getting lost, accident etc.) was widely accepted in the group. Most of the participants also accepted the locating of someone's own children and some of them accepted the locating of their own spouse in situations where the person concerned had consented to being located (shopping, exhibitions etc.). However, privacy issues and misuse of this information was brought up as a main concern in this discussion. Participants were not aware of either technical possibilities or legislation related to location and were adopting quite easily opinions and beliefs from other participants. The participants emphasised that a person should always be able to refuse being located and especially refuse that this information be transmitted to someone else (except to the authorities in case of emergency). Overall, it was seen more acceptable if the location was subject to the persons' own activity (asking to be located). Also the cost and actual gain of all these services were concerns of some of the participants.

Service ideas locating other moving objects were mainly related to locating the participants' own vehicle. Participants indicated this service to be useful both in a situation where the participant has forgotten where she/he parked the car, or if the vehicle is stolen. Also locating animals, for example hunting dogs might be a useful service to some people. Service ideas using the users' location were often related to spending time in an unfamiliar environment and therefore guidance as part of the service was seen to be important. Guidance should include clear directions as to how to get to the end destination and information about the distance to the destination. Ideas for locating services included the location of restaurants, cash machines, civil service departments, beaches (abroad) etc. Additional information related to service location was services' business hours, prices and special offers. Other service ideas based on location were user location when ordering taxi, and saving and possibly sending the location information to someone else (location of mushrooms, berries, special birds etc.). Also weather forecast and the probability of rain based at the users' location or the location the user is travelling to were mentioned as possible service ideas.

## **8. Daily travelling by car**

### **Respondents**

In this group, there were four female and three male participants. The participants were aged between 24 and 74. Four of them had the possibility to use a car all the time and two of them had the possibility to use a car whenever they needed (sharing the car with someone). Three of them had driven less and four of them more than 20 000 km during the last year. All of the participants drove mainly short (under 50 km) trips and all of them made their daily trips by car. Four of the participants had a job, one was a student, one a pensioner and one was taking care of the household. All of the participants had a mobile phone.

### **Summary of results**

The focus in this group meeting was information needs in everyday travelling (short trips) by car. However, unfamiliar environments were also discussed at some point of the discussion. After the discussion about daily travelling by car, the group participants were told about a technology that would enable locating either static (buildings etc.) or dynamic (moving objects) objects and provide this information to users. The participants were asked to consider possible service ideas that would use this possibility of locating objects.

#### *Travelling daily trips by car*

When planning a daily trip by public transport, the information needs were listed as 1) information about other possible transport modes (public transport), 2) information about possible

congestion (accidents etc.), 3) information about possible events (road works, special happening etc.) affecting the trip (time and route), 4) route optimisation (fastest, shortest, most comfortable etc.), 5) information about road conditions (mainly during wintertime), 6) estimated trip duration and 7) information about parking (spaces, price, payment methods etc.).

Participants emphasised that the real-time information about events and incident that affected the route selection and travel time was important. It was stated that in a familiar environment, the route optimisation and estimated travel duration should include this information and the route selection should be based on this dynamic traffic situation information. During the wintertime, information about road conditions (and maintenance) was stated to be important even when travelling short, daily trips. Also information about parking possibilities and more detailed information about price and payment methods was seen to be useful. The participants also indicated that it would be useful to have information about other transport modes as well (public transport), since the participants were not very familiar, but still sometimes maybe willing to travel by public transport to the city centre for example.

Information while travelling was partly similar to pre-trip information needs. Participants indicated information related to possible events or traffic incidents and re-calculated travel duration (estimation) to be important also during the trip. In the case of unexpected events or incidents, the participants would find information about other possible routes useful. Additional information about the cause of congestion or delays was indicated to be important as well. Information about petrol prices and the location of a specific petrol station was listed also as an information need while driving. When travelling in an unfamiliar environment, guidance directions while driving (car navigation) was indicated to be useful. Especially when looking for a specific address, the guidance would be very useful (street name, building number).

When travelling to the final destination, the information needs were usually related to parking. Participants stated that information about the nearest free and legal parking place would be very useful, especially in the city centre area. The participants emphasised the importance of real-time information providing the driver with information about 1) whether it is permitted to park in a specific place for the required duration, 2) how much it will cost to park there, 3) what the possibilities to pay for the parking are (mobile phone, cards, coins etc.) and 4) what the business hours of the car park are (how long it is open). Also guidance when leaving especially larger car parks was indicated to be useful (location of exits, directions, street names etc.).

The most important information was real-time information about events and incidents affecting the route selection and travel time. Also information about parking places was indicated to be very important. Guidance in an unfamiliar environment and information about road condition during wintertime were also indicated as important information.

#### *Possible services enabled by location technology*

The ideas of possible service solutions for this technology were related to 1) locating people, 2) locating other moving objects (vehicles, objects etc.) and 3) locating services (and using users' location as one criteria). When locating people, the possible service ideas were mainly related to special groups or special situations. The most commonly accepted use of location was with prisoners when moving outside the prison or demented patient. Also locating a person that is possibly in danger (getting lost, accident etc.) was widely accepted by the group. Most of the participants also accepted the location of their own children and the location of friends in some cases (meeting the children or friends at a crowded event or place etc.). Also when moving in a larger group, the possibility to locate the group members was indicated to be useful. However, privacy issues and criminal misuse of this information was raised as one

of the discussion topics as well. The participants emphasised that a person should be able to decide when she/he can be located and who can use this information. Overall, it was seen more acceptable if the location was subject to the persons' own activity (asking to be located). Also the cost of these services was a concern of some of the participants.

Service ideas locating other moving objects were mainly related to locating the participants' own belongings: vehicle, animals or smaller items such as mobile phone, bike or keys. The participants indicated that a service related to locating their vehicle would be useful if the participant has forgotten where she/he left the car (parking) or as a tool for car navigation (direction guidance while driving). Also locating dogs might be a useful service to some people. Information about the users' location could be used for example when looking for the nearest restaurant. Other service ideas based on location were guidance in an unfamiliar environment or following a sporting event that is spread through a large area, for example orienteering.

## **9. Daily travelling by car, group 2**

### **Respondents**

In this group, there was three female and three male participants. The participants were aged between 25 and 51. Five of them had the possibility to use a car all the time and one of them had the possibility to use a car whenever needed (sharing the car with someone). Three of them had driven less and three of them more than 20 000 km during the last year. All of the participants drove mainly short (under 50 km) trips and all of them made their daily trips by car. Four of the participants had a job, one was a student and one was taking care the household. All of the participants had a mobile phone.

### **Summary of results**

The focus in this group meeting was information needs in everyday travelling (short trips) by car. However, unfamiliar environments were also discussed at some point of the discussion. After the discussion about daily travelling by public transport, the group was asked to consider their information needs while shopping or moving in large shopping centres or shops. After the discussion about information needs while shopping, the group participants were told about a technology that would enable locating either static (buildings etc.) or dynamic (moving objects) objects and provide this information to the users. The participants were asked to consider possible service ideas that would use this possibility of locating objects.

#### *Travelling daily trips by car*

When planning a daily trip by car, the information needs were 1) estimated trip duration, 2) information about possible congestion (accidents etc.), 3) information about possible events (oversized transport, special happening etc.), 4) route optimisation, 5) information about other possible transport modes (public transport), 6) information about road conditions (during wintertime) and 7) information about parking (spaces, price, payment methods etc.). Participants emphasised that the real-time information about travel duration (events or incident affecting the travel time) would be the most useful information when making daily trips. Route optimisation including this kind of information would be quite useful if there are different possibilities for route selection. The information about possibilities to use public transport might be useful in special conditions, for example in case of congestion or if travelling to the city centre where parking the car is expensive and finding free parking spaces might be difficult. During the wintertime, information about road conditions and maintenance activities that are already done was stated to be important. Also information about parking possibilities and more detailed information about price and payment method was seen to be useful.

While on-trip (travelling), participants indicated information related to possible events or traffic incidents and re-calculated travel duration (estimation) or route (if possible) to be important. The real-time information about the ending time for a large event (ice hockey game etc.) was indicated to be important sometimes. Information about petrol prices and the location of a specific petrol station was also indicated to be useful. When making longer trips, a number of participants stated that additional information about services (food, shops etc.) at those petrol stations would be useful as well. More detailed information about possible technical problems with one's vehicle and information about towing services etc. could be important if a problem occurs. If travelling in an unfamiliar environment, guidance directions while driving (car navigation) was indicated to be useful. Safety-related information such as warnings about animals on the road or approaching emergency vehicles and rapid changes in road conditions was stated to be important by some participants. Also speed recommendation and warnings near schools were indicated to be important.

When travelling to the final destinations, the information needs were usually related to parking. Also guidance to the final destination was indicated to be important in unfamiliar environments. Participants stated that information about the nearest free parking space would be very useful, especially in the city centre area. The participants emphasised the importance of real-time information providing the driver with information about the permitted duration of parking, the cost of parking and payment methods (mobile phone, cards, coins etc.). An automatic payment method optimising the time paid for (starting when leaving and stopping when returning) was stated to be useful.

The most important information was real-time information about congestion affecting the route selection and travel duration. Re-routing the itinerary while driving (based on dynamic traffic information) was indicated to be important as well. Also information about road surface conditions (road works, slipperiness etc.) was indicated to be one of the most important information. Real-time information about congestion (or traffic density), route optimisation based on real-time traffic information and estimated real-time travel duration were indicated to be the most often used information: four of the six participants stated that they would use this information almost daily.

#### *Shopping and possible services enabled by location technology*

The information needs related to shopping were 1) finding a shop or service (location, business hours, rush etc.), 2) finding a product or product group (cheapest, nearest), 3) information about sales and 4) inside guidance in large shops or shopping centres. Participants indicated that information about the location of shops or service and additional information about business hours and the number of people at the shop would be useful when selecting the shop or service. The shop selection could also be made based on product location (looking for specific product). Additional parameters such as lowest prices might also be used as a selection criteria.

Finding services included information needs about the nearest restaurants or shop providing similar product. Additional information such as business hours, menus and prices were indicated to be useful sometimes. Also information about the next possible available time (hairdresser etc.) would be useful when looking for this type of service. Information about special offers at selected shops was indicated to be useful sometimes. Inside guidance was stated to be useful in large buildings, shops and shopping centres.

#### *Possible services enabled by location technology*

The ideas of possible service solutions for this technology were related to either locating people or locating other moving objects (vehicles, objects etc.). When locating people, the possi-

ble service ideas were mainly related to special groups or special situations. The most commonly accepted use of location was with prisoners when moving outside the prison, demented patients or elderly persons. Also locating a person that is possibly in danger (getting lost, accident etc.) was widely accepted by the group. Most of the participants also accepted the location of their own family members if all members agreed with this. Some participants were more concerned about privacy issues and the development of society if people are constantly locating each other with widely spread solutions. All the participants emphasised that a person should be able to decide when she/he can be located and who can use this information.

Service ideas locating other moving objects were mainly related to locating their own vehicle. Participants indicated that this service would be used both for private cars (stolen car) but also for public transport vehicles in order to provide information about their location. Also locating other belongings (dogs, bicycles, boats and other valuable belongings) might be useful. However, the price was seen as the most important factor affecting the use of these kinds of services.

## **10. Travelling longer trips by public transport**

### **Respondents**

In this group, there was three female and two male participants. The participants were aged between 19 and 46. Four of them had a driving license, but most of them could use a car only very seldom or not at all. All the participants used public transport when making longer trips at least once a month. They also used it for their daily trips. Three of the participants had a job and two were students. All of the participants had a mobile phone.

### **Summary of results**

The focus in this group meeting was information needs when making longer trips by public transport. In addition to information needs related to travelling by public transport, the group discussed information needs when travelling or staying in an unfamiliar environment (touring, foreign city etc.).

#### *Travelling longer trips by public transport*

When planning longer trips by public transport, the information needs were 1) what are the available transport modes (bus, train etc.) and routes to the destination station, 2) what is the most suitable transport mode, route and line and 3) are there spaces on the selected shift (booking). Planning seemed to be a very important part when making longer trips by public transport. The participants emphasised that information including all possible connections (train, bus, aeroplane etc.) to the final destination is the most important information that is required when planning the trip. The most suitable transport mode, route and line is then usually selected from these possibilities using different criteria. The criteria could be the location of stops (closest to the start/end destination), prices, travel duration and comfort-related issues. After selecting the most suitable mode, route and line, the participants indicated that real-time information about spaces on that shift and the possibility to make a booking would be useful.

Most of the information needs when travelling to the stop were related to travelling on the local public transport system. The information needs were related to real-time information about the stop times (especially at the destination stop when changing to the long-distance vehicle) and route optimisation. Reliability of the shorter trip by public transport was the most important issue, since being late could mean missing the long-distance connection. At the long-distance station, terminal or stop, guidance to the ticket office or automates as well as to the correct platform was seen to be useful information. In the case of long queues at the ticket

office, advance information about this and information about alternative possibilities to purchase the tickets were indicated to be important as well. Also information about lockers and services in the terminal area could sometimes be important. Real-time information about the stop time (when leaving) would be very important, especially if there has been some changes such as delays or re-arrangements. Information about changes and the possibilities to re-route the trip were indicated to be important in these cases.

The information needs when travelling inside the vehicle were mainly related to finding the correct vehicle (confirmation) and seat, but also information about special situations or changed schedules, getting off at the correct stop and guidance when changing from one vehicle to another one was indicated to be important. Information about estimated travel duration (when arriving) to the final destination and current location of the vehicle on its route was indicated to be useful. Information about the closest stop to the final destination and announcements of the next stops were seen to be useful when travelling in an unfamiliar environment. Also information (real-time stop time for both vehicles, guidance to the correct change stop etc.) when changing vehicles or mode of transport was indicated to be important especially in large terminals or when the time available to change vehicle is very short. In the case of unplanned changes (delays etc.), information about other possibilities to continue the trip would be important. When travelling from the stop to the final destinations, the information needs were usually related to travelling in an unfamiliar environment. All participants indicated that it would be useful to have some kind of guidance to the final destination. The guidance should include information about the main buildings, street names and other stations, terminals and stops.

The most important information was information about the possible modes and routes and time schedules. Also information about prices, the most suitable mode and route and travel duration (estimation) were selected more often to be one of the three most important information. According to the participants, the most frequently used information would be estimation about total travel duration.

#### Possible services enabled by location technology

The ideas of possible service solutions for this technology were related to 1) locating people, 2) locating other moving objects (vehicles, objects etc.) and 3) locating services (and using the users' location as one criteria). When locating people, the possible service ideas were mainly related to special groups or special situations. The most commonly accepted use of location was with demented patient or elderly people. Also locating a person that is possibly in danger (lost in a forest or at sea) was widely accepted by the group. Most of the participants also accepted the location of their own children and the location of friends in some cases (meeting the children or friends at a crowded event or place etc.). However, privacy issues were raised as one of the discussion topics as well. The participants emphasised that a person should be able to decide when she/he can be located and who can use this information and by default, locating a person should not be allowed. Permission should be asked again after an agreed period of time and the person should be able to forbid the location at will. Overall, it was seen to be much more acceptable if the location is based on the person's own activity (asking to be located). The real advantage and gain of these services was a concern of some of the participants.

Service ideas locating other moving objects were mainly related to locating the participants' own belongings: vehicle, animals or smaller items such as mobile phone and bike. Participants indicated that a service locating other vehicles would be useful if used in taxis (drivers' safety) or public transport vehicles (real-time information).

## **11. Travelling longer trips by car**

### **Respondents**

In this group, there was two female and four male participants. The participants were aged between 23 and 60. Four of them had the possibility to use a car all the time and two of them had the possibility to use a car whenever needed (sharing the car with someone). All the participants made longer (over 100-km) trips by car at least monthly. Two of them had driven less and four of them more than 20 000 km during the last year. Five of the participants had a job, one was student and one was pensioner. All of the participants had a mobile phone.

### **Summary of results**

The focus in this group meeting was information needs when making longer trips by car. In addition to information needs related to making longer trips by car, the group discussed information needs when travelling or staying in an unfamiliar environment (touring, foreign city etc.).

#### *Travelling longer trips by car*

When planning longer trips by car, the information needs were 1) information about other road users (congestion), 2) information about accidents (or other special events), 3) estimated travel time to the final destination, 4) route optimising (speed limit, road works etc.) and 5) services and attractions on the route.

The participants emphasised that information about the congestion and special events (accidents) was useful when making longer trips, since there is usually more possibilities to either select another route or stop re-schedule the planned schedule. Information about the best route<sup>17</sup> selection was indicated to be useful, especially if based on dynamic traffic information (on-trip re-routing). Some participants stated that it would be nice to have information about services, attraction and other points-of-interest as well.

On-trip information needs were similar to the information needs when planning the trip. Real-time information about congestion, events or accidents was indicated to be important during the trip. In the case of an accident or special event, information about the estimated delay and possible detours were indicated to be important. During the wintertime, information about air/road temperature or warnings about slippery roads was indicated to be important. On-trip route guidance (car navigation) was indicated to be important if travelling in an unfamiliar environment. Some more detailed maps (street names, main buildings etc.) of the destination city would be useful as well. Information about the location of the nearest services (petrol station, restaurants, towing, garage etc.) or rest places might be useful as well.

Information about parking (nearest space, price, safety etc.) was stated to be important both in familiar, but specially in unfamiliar cities. Also a map with street names or other guidance instructions were indicated to be very important. Sometimes additional information about the location of certain services (pharmacy, florist, cash machines etc.) would be useful as well. If connection with a different transport mode is needed, information about parking and more detailed guidance to the correct stop or platform was indicated to be useful.

The most important information was guidance in an unfamiliar city, car navigation and guidance if a detour is required. Also information about accidents and congestion were selected

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<sup>17</sup> Criteria for selecting best varied quite much depending on participant and situation. Some criteria mentioned during the discussion were the fastest (speed limits) route, most comfortable route (road works, traffic light etc.) or services or attraction on the route.

more often to be one of the three most important information. According to the participants, the most frequently used information would be the estimation about total travel duration.

*Information need when spending time in an unfamiliar city*

Information needs when spending time in an unfamiliar city were related to 1) information about culture and customs (abroad), 2) information about different areas in the city (parks, beaches, slums etc.), 3) information about attractions, points-of-interest (POI) and events, 4) information about services and 5) information about public transport (when not travelling with own car).

Participants indicated that when travelling abroad, information about the country's culture and customs might be useful. When spending time in an unfamiliar city, in addition to maps with streets and buildings, it would be useful to have information about different areas<sup>18</sup>. In addition to this, it would be useful to have attractions and point-of-interests on the maps as well. In addition to information about location of different attractions, information about special events etc. was indicated to be important. This way the person could either participate in the event or bypass it (if wanting to travel fast etc.).

Information making the finding of the nearest service easier was indicated to be important, especially when looking for a pharmacy, police station or doctor. Additional information needed after locating a shop, restaurant or off-licence was business hours and information about menus and prices for example.

Information about public transport was stated to be important when travelling without a car. Information was needed about the fares and payment methods<sup>19</sup>, the reliability of time schedules and the safety (abroad). In addition, information about line maps and the best route from one place to another would be useful in an unfamiliar city. Information about taxis (prices, payment methods etc.) was indicated to be important as well.

When discussing possible service solution for guidance in an unfamiliar city, one proposal was an electronic map including information about street names, buildings, attractions and point-of-interests, where the real-time information about the users' location would be shown as red dot. However, the participants stated that it would be important, that the user is able to select her/himself which buildings or attractions are shown on the map. Also the location of the requested services could be shown on the map. The reservations about this kind of service were mainly related to the reliability of the information and the cost to the user.

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<sup>18</sup> Participants indicated that for example information about how safe a specific area is would be important if travelling abroad. Also information about parks, beaches and other larger area was indicated to be useful.

<sup>19</sup> Information about special prices (two-day ticket etc.) and places where the ticket can be bought.