Key Usability and Ethical Issues in the NAVI programme (KEN)

Deliverable 5

Adaptation of Technology and Usage Cultures - Evolving New Usage Cultures of Personal Navigation

Part II

Version 2.3

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Tiivistelmä

Yksi KEN-projektin tehtävistä on ollut tutkia ja kartoittaa henkilökohtaisen navigoinnin tuotteiden ja palveluiden potentiaalisia käyttäjäryhmiä ja käyttökulttuureita. Tutkimuksen alkaessa, vuoden 2001 alkupuoliskolla, ei uudenlaisia henkilökohtaisen navigoinnin piiriin kuuluvia tuotteita ollut kuluttajien saatavilla juuri nimeksikään ja kaiken kaikkiaan jo pelkkä käsite *henkilökohtainen navigointi* tai esim. paikannusteknologian hyödyntäminen erilaisissa palveluissa oli varsin vierasta suurimmalle osalle kuluttajia. Tämän takia lähestyimme potentiaalisia uusien henkilökohtaisen navigoinnin tuotteiden kuluttajia ja käyttäjiä esittelemällä heille skenaarioita uusien tuotteiden mahdollisista käyttötilanteista. Näin haastateltavat käyttäjät pystyivät hahmottamaan uudenlaiset tuotteet ja palvelut, ja arvioimaan niitä. Tutkimustilanteessa osallistujat arvioivat asiantuntijoiden koostamien henkilökohtaisen navigoinnin tuotteiden käyttöskenaarioiden hyödynnettävyyttä ja uskottavuutta kuluttajan näkökulmasta. Tutkimuksen avulla kartoitettiin asenneilmapiiriä: ennakkoluulot, pelot, uhat vs. mahdollisuudet, toiveet, odotukset, olemassa oleva kysyntä, maksuvalmius uusista palveluista ja käytettävyyskriteerit. Lisäksi potentiaalisia käyttäjiä pyydettiin ideoimaan uusia navigointituotteita sekä käyttötilanteita ja –tarpeita esitettyjen skenaarioiden lisäksi niin omalla kohdallaan kuin muitakin käyttäjäryhmiä tarkastellen.

Uusia tuotteita ja palveluita, joiden voidaan katsoa kuuluvan henkilökohtaisen navigoinnin piiriin, on lanseerattu NAVI-ohjelman aikana markkinoille yhä enemmän. Osa tuotteista on jäänyt pilotointiasteelle. Osa tuotteista on kuitenkin säilynyt kuluttajamarkkinoilla, jolloin näillä tuotteilla voidaan olettaa olevan käyttäjäryhmiä ja käyttöä, joka on joko oletetun kaltaista tai ennakoimatonta. Uusien tuotteiden kohdalla voidaan olettaa löytyvän muotoutumassa olevia käyttökulttuureita, samoin kuin perinteisempien tuotteiden kohdalla voidaan olettaa olevan käynnissä uusien käyttötapojen innovointia. Uusia henkilökohtaisen navigoinnin tuotteita ovat mm. Benefon ESC! (maailman ensimmäinen GSM–puhelin, johon on integroitu GPS), erilaiset tekstiviesti- tai WAP-pohjaiset reittiopastuspalvelut sekä esim. kämmenmikroihin saatavat GPS-kortit sekä kartta- ja reittiopastusohjelmistot. Jo perinteisempien GPS–navigaattoreiden yleistyminen on myös tuonut mukanaan uusia, viihteellisempiä paikannusteknologian käyttötapoja. Verkkopaikannusta on pyritty hyödyntämään reitti- ja opastuspalveluiden lisäksi muunlaisissakin sovelluksissa.

Tarkemman tutkimuksen kohteeksi valittiin tuote (Benefon ESC!), jonka käyttökulttuurin muotoutumista voitiin havainnoida tuotteen markkinoille lanseeraamisesta lähtien. Toiseksi kohteeksi valittiin GPS –laitteelle kehittynyt uusi maailmanlaajuinen harrastesovellus (Geocaching), jonka kautta tarkasteltiin käyttökulttuurien muotoutumista pidemmällä aikavälillä. Kuluttajamarkkinoille on kehitetty ja lanseerattu myös uudenlaisia mobiileja ja paikkatietoisia pelisovelluksia. Raportissa tarkastellaan uudenlaisten viihdesovelluksien kenttää yleisellä tasolla ja esimerkkien kautta. Verkkopaikannukseen perustuvaan Botfighters peliin tutustuttiin lähemmin osallistuvan havainnoinnin avulla.

Henkilökohtaisen navigoinnin alaan kuuluvien tuotteiden käyttökulttuurien tarkasteleminen tuottaa tärkeätä tietoa uusien tuotteiden lanseeraamisesta kuluttajille, tuotteiden käyttöönottamisesta ja jokapäiväisestä käytöstä erilaisilla käyttäjäryhmillä. Olemassa oleviin tuotteisiin ja näiden käyttäjiin ja käyttökulttuureihin tutustuminen hyödyttää uusien tuotteiden tutkimus- ja tuotekehitystä, sillä tuotteiden käyttäjäkokemuksen havainnoiminen on useimmiten mahdollista vain tuotteiden todellisessa käytössä niiden oikeassa käyttöympäristössä.

Henkilökohtaisen navigoinnin piiriin kuuluu sovelluksia, joissa esim. verkkopaikannus voi olla kuluttajalle vain melko näkymätön, palvelun käytettävyyttä helpottamaan pyrkivä piirre. Tällöin uuden osasovelluksen käyttöönotto liittyy sen saumattomuuteen kokonaispalvelussa. Täysin uusien tuotteiden ja palvelukonseptien omaksuminen on useimmiten suhteellisen pitkä prosessi, jossa tuotteiden kulttuurinen käyttö muokataan erilaisille käyttäjäryhmille sopivaksi. Uusiin teknologioihin liittyvien tuotekonseptien omaksumisen ja muokkaamisen on yleensä katsottu tarjoavan erityisesti nuorille ja teknisesti orientoituneille miehille kuuluvan toiminnan kentän. Tätä näkemystä tukee myös meidän havaintomme uusista paikannusteknologiaa hyödyntävistä tuotteista ja palveluista, joissa toiminnallisuus on usein tärkeämpää kuin toimivuus ja tuotteen uutuudella on merkittävä rooli sen valikoitumisessa juuri näiden ensimmäisten omaksujien käyttöön.

Abstract

Key Usability and Ethical Issues in the NAVI programme (KEN project) is one of the horizontal support projects in the Personal Navigation (NAVI) programme of the Ministry of Transport and Communications in Finland. The aim of the KEN project is to assure that usability and ethical issues are taken into account in the projects of the NAVI programme. Together with the projects, we are identifying and solving usability and ethical problems related to personal navigation.

One of the tasks of the KEN project is to examine the potential user and usage cultures for navigation devices and services. New navigation technology is not yet very common and people in general are not familiar with new navigation services and technology. This was one reason why we decided first to examine potential user groups by using scenarios. Another reason is that assessment of user need is the starting point in product design development. Our goal was to collect more general knowledge from the potential users about how they would like to adapt and modify the concept of personal navigation for their everyday life.

The growing industry for new personal navigation solutions has brought new products on the market, both devices and services, but the number of these solutions has been far smaller than was predicted earlier. Also, a number of solutions have already faded from the market place and for example, in the case of value added services, the stability of these services is not very strong. However we have found some good examples on studying new usage cultures of personal navigation and we could have been observing rather well the whole process of adaptation for new products and the dynamic process of evolving new usage cultures.

This report presents the results of the studies on new usage cultures of personal navigation solutions. We have picked up three different categories to study personal navigation usage: new device with new services, new concept of mobile gaming, and new innovative and entertaining usage for already existing devices.

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1 Introduction

1.1 Purpose

Key Usability and Ethical Issues in the NAVI programme (KEN project) is one of the horizontal support projects in the Personal Navigation (NAVI) programme of the Ministry of Transport and Communications in Finland. The aim of the KEN project is to ensure that usability and ethical issues are taken into account in the projects of the NAVI programme. Together with the projects, we are identifying and solving usability and ethical problems related to personal navigation.

One of the tasks of the KEN project is to examine the potential user and usage cultures for navigation devices and services. There already exist new personal navigation devices and services on the market and their number is expected to rise. Some of the services and devices have their own user groups and their usage is now well established. Among the new products and services there are traditional and presumed ways of use, but users also invent whole new ways to use the product to better satisfy their needs.

Traditionally, products and services related to navigation and way-finding have included maps, compasses and various route guidance applications. The Global Positioning System (GPS) has seen its penetration on the consumer market increase since the GPS signal degradation called Select Availability (SA) was removed by the United States government on 1 May 2000, and as the price and size of GPS devices became more user-friendly between 1990 and 2000. GPS navigation has become so common nowadays that it could probably be classified as one of the traditional methods to help people navigate in various environments (e.g. hunters, boaters, hikers).

Novel positioning technologies and applications (e.g. A-GPS, WLAN, Bluetooth) and the reforming of existing technologies (e.g. GPS, cell-id based positioning) have signalled a brand new start for developing, producing and marketing positioning technologies and navigation products and services for consumer markets. The emerging concept of 'personal navigation' describes this new starting point in which new technology is intended to be utilised widely among different potential user segments around the world by focusing on their actual needs for navigational services.

In the first part of the KEN project's Deliverable 5, adaptation of technology and usage cultures (spring 2001), we concentrated on evaluating scenarios made for personal navigation. Using scenario evaluations, we studied the attitudes of the potential users of personal navigation systems. In these evaluations the users were asked to state their opinions of scenarios built by experts. We wanted to know how credible, useful and usable these services and products presented in the scenarios were considered. Potential users were also encouraged to describe what they saw as concerns, hopes, opportunities and threats with regards to these new ideas and propose additional concepts not presented in the scenarios.

Approaching potential users of personal navigation through scenarios was practically the only possible way to present and evaluate the concept to the users because at that time (first quarter of 2001) there were no consumer products or services available reflecting this new idea of personal navigation. The introduction of products and services for personal navigation has happened little by little over the last two years. There has been many pilot services (e.g. value added services for mobile devices and the web) and some of these pilots have also remained on the market. A number of totally new products that utilise positioning technology in consumer environments have also been introduced. We have

actively monitored the kind of products and services that have been developed for the consumer market and the way in which these new concepts have been introduced and adopted by different user segments.

In this report, the different usage cultures for different navigation products and services are presented. Studying usage cultures provides a comprehensive, hermeneutic perspective on the user-product interaction in a particular environment. This kind of approach emphasises the real-life context of usage and helps us understand the dynamic process of usage cultures. Some of the results are based on direct user interviews and questionnaires whilst others are based on more interpretative methods (e.g. participant observation) among the navigation services. We chose to study more thoroughly the Benefon ESC! GSM phone integrated with a GPS receiver, because it was a totally new product innovation with several unparalleled features in the field of personal navigation. We also present the services offered to GSM phone (cell-id-based positioning) and chose to observe more thoroughly one concept of mobile gaming (Botfighters). This concept was chosen because it was a fresh, novel kind of approach to mobile gaming and the use of mobile phones. Further, we map up the hobbies or interests that have emerged around basic GPS devices and get acquainted with Geocaching. All these examples had communities that worked in reality and virtually (e.g. web sites). This offers perspectives to understand more thoroughly the usage cultures and communality twined around the newly created concept of personal navigation.

This report is targeted at anyone participating in the design of products and services for personal navigation and does not require any background knowledge about personal navigation.

1.2 Scope

This is the second part of Deliverable 5 of the KEN project. The first part of the deliverable presented results of the evaluations of navigation scenarios with potential user groups. The purpose of part two of Deliverable 5 is to present studies of usage cultures and technological adaptation and knowledge of selected navigation services and devices. The analysis is based on studies conducted during the first half of 2002.

1.3 Definitions, Acronyms, and Abbreviations

Usage culture = collectively agreed or modified way of using a product or a service

Authentic user = user who has required the product for his/her own purposes (work, leisure)

Pilot user > test user = user who is testing the product or technology for the research and development

Semimobile = refers to contexts where users and surroundings do not constantly move but wireless communication is the most suitable way to conduct business

Fully mobile = environment that imposes more restrictions to mobile use because the user has other tasks simultaneously

Required mobility = e.g. a location-based game that can actually force a player to be mobile

User experience = usage of the product (usability, utility, functionality) and of the presentation of the product (showing it, status, fashion)

GPS = Global Positioning System

GSM = Global System for Mobile Communications

PNS = personal navigation system

1.4 Overview

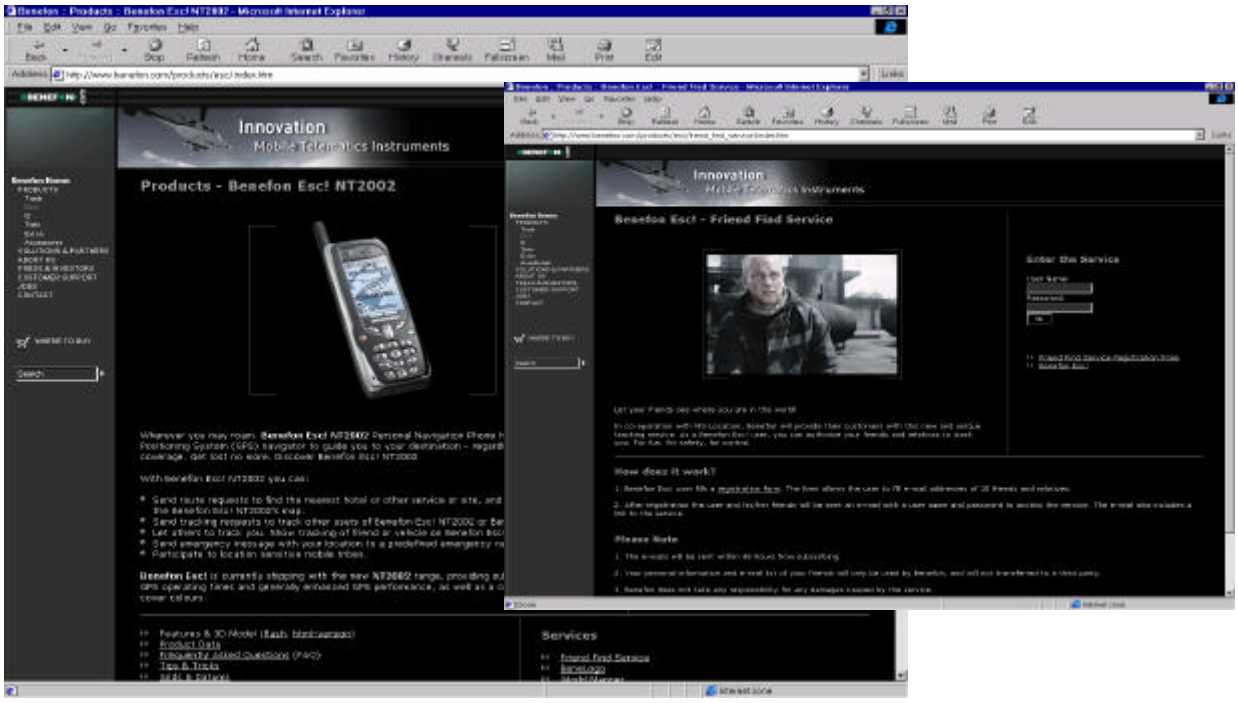
In Chapter 2 we present the results of our studies of Benefon ESC! users. The consideration of location-based gaming is presented in chapter 3. Two cases of mobile and location-based gaming (i.e. Botfighters and Geocaching) are presented more thoroughly. Chapter 4 concludes on the results and outlines further research on potential user groups and already existing PNS usage cultures.

2 Benefon ESC!

2.1 Background

Besides the military context of use, GPS devices have already been used for quite a long time in other kind of professions as well. GPS devices and map plotters have also become more common on the consumer market in the late 1990s, and the basic customary users for this technology include boaters and sailors. Car navigation with GPS has also developed quickly over the last few years and it is not peculiar nor rare to find GPS navigators in luxury cars or in business vehicles (e.g. taxis). Handheld GPS devices have also been used for many years with outdoor hobbies (sailing, boating, hiking, hunting, picking berries or mushrooms) but these devices have been adopted more widely by these special interest groups in recent years. For these groups, the basic need to use a GPS device has been to mark their starting point when going e.g. in the woods and, later on, be able to come back to the same point with the help of the GPS (Miettinen, 1999 and 2002).

The integration of mobile phone (GSM) and satellite navigator had been under development for a few years and the release of products on the market has been expected from a couple of key players since 1999. In May 2001, a brand new concept of combination was launched on the consumer market when Benfon released ESC!.



Picture 1. Screen shots from the Benefon web site on 31.10.02

The goals of the Benefon ESC! study were:

- study the evolving usage cultures of personal navigation
- study marketing materials and media to understand what are the presumptive users and usage of the product
- study the realised usage and evolving usage cultures for the product with the help of the users: 1) by interviewing them; 2) by observing users and usage; 3) by participating; 4) by collecting experiences of usage otherwise (e.g. discussion groups)

2.2 Promotional material and adds

"Benefon Esc! is a mobile navigation instrument combining a top performance 12-channel GPS navigator and a state-of-the-art dual band GSM phone. Lots of interesting features etc., support for grids and datums, Friend Find-function, downloadable maps from the internet, waypoints, routes, GPS-compass, changeable logo on the start-up screen and much more." (www.benefon.com)

ESC! is described in the **promotional material** as being a device for:

- contemporary nomad - travelling is my business and hobby, outdoor lover, globetrotter
- escape and extreme environment - wilderness and city environment, reachable 24 hrs a day, global and busy
- masculine, youthful, individualistic users

Media
ESC! has been introduced mainly in information technology magazines (PC magazines, magazines focusing on mobile phones), outdoor hobby magazines (e.g. Metsästys ja kalastus, Erä, Moottorikelkka) and traditional popular technical magazines (Tekniikan maailma and Tuulilasi).

The media focuses the target group for the product to be outdoor people (e.g. hikers, hunters, boaters). "It is clear that Benefon ESC! is not targeted at mass markets and it is not competing in sales against cheap models. The device is targeted at the mobile outdoor enthusiast, who may have previous experience of using GPS in boat or in cross-country environment" (Tekniikan Maailma 12/2001). Das Benefon ESC! bietet vor allem Outdoor Freaks viele Funktionen - ESC! offers many functions to all outdoor freaks (Telecom 25.7.2001).

Targeted implicitly at men. Connect ??; a German mobile phone magazine, makes an exception. In an article, they introduce pictures of a woman as a potential user of the device, and the city as a potential navigation environment (travelling by bicycle).

Targeted for technofreaks. The package gives the impression of a device that will be cherished by every technofreak (Sotilastekniikka 4/01)

The device is something totally new, because it is a combination of a GPS and mobile phone and it has special features. "It has map interface, Friend Find and Yellow Pages. That is why the price is higher than the GPS and GSM sold separately and it is worth it (e.g. Tekniikan Maailma 12/2001) "It is a GPS with mobile phone" (ITnetPlus 8/2001)

Its use needs to be learned (Tekniikan maailma 12/2001) But it is not too difficult to learn the basics (Metsästys ja kalastus 7/2001). Vs. It's too difficult to use (Tuulilasi 8/2001)

Safety. One of the main emphasis in introducing the device is in safety or risk prevention and control. Safety is also one of the key issues brought up in the media. It is an *"electronic survival package"* (e.g. Tekniikan Maailma 12/2001, Ase & Erä 3/2001)

Professional feeling and usage commented, but not so often (alone workers, e.g. Metsälehti 14/2001.)The presumptive usage for the device is then thought to occur in various environments (city - in the wild) and also in very extreme conditions (cold, rain, outdoor).

Robustness is seen as one of the key feature. It "Feels very solid, featuring stainless steel construction, with a rubberised front and side panels for grip. It is also quite attractive, in a fairly rugged, purposeful kind of way" (Mobility, Yearbook 2001).

2.3 Questionnaire and interviews

The e-mail questionnaire (appendix 1) was sent to Benefon ESC! users whose contact information we got from Benefon. Benefon first contacted the ESC! users and asked their permission to give their contact information to us for research purposes. One user of Benefon Esc! was also contacted through our own contacts. In the first phase, 16 people in total replied to the questionnaire and five of them were also interviewed to obtain further information. Also, some users who did not reply to the questionnaire were contacted again and asked for an interview and we managed to arrange interviews with six users that way.

In total, 22 users of Esc! were included in our study. 11 users filled just the questionnaire. Another 11 users were interviewed, 8 of them face to face and 3 by phone. In the questionnaire and interviews, basic information (such as age, education, profession and hobbies) was requested. Questions also included the user's reason for buying the navigation product, how long had he/she been using it, what were the product's best and the worse features, in which situations the user had used the product etc. The questionnaire is presented in appendix 2. Most of the respondents to the questionnaire were keen to answer the questions; in general, they gave long replies to questions such as how they had used the product. However, the interviews deepened our understanding of some issues about the usage situations and users themselves.

We noticed almost immediately that some of the ESC! users possessed the device because they were either so-called pilot users (test users) or the kind of work they were engaged in at the time meant that they were using ESC! for their own studies or the development of software. Seven of the users could be classified in this group; users that had not required the device just for their own purpose but were also using it as test user (2 females, 1 male) or as experts in GPS and applications related to it (4 males). However, we also include some material gathered from the pilot users because in some respect they have used the device as their own and for their own purpose. The answers of authentic users (15) are stressed when discussing e.g. why the device was acquired.

2.4 Users

Most of the users in our sample were males (20 out of 22). The main reason for this might be that the navigation device the interview was focused on was quite new and also required some interest for new telematic technology. Men usually are the early adopters when technical devices are at issue.

The average age of the users was about 40. It is probably slightly higher than expected but the reason for this might be that the most recent technological products on the market are usually quite expensive

and are bought by people who have some spare cash and a fairly stable state of life. These characteristics are usually found in slightly more mature individuals.

The users' hobbies were mainly outdoor activities in which they could use the navigation device, for example in boating and hiking. Most of the users also had prior experience with a GPS device. Most of them (16 out of 22) also owned another phone for their daily use. Tables 1 and 2 describe the users. Seven pilot users are labelled by italic font.

15 authentic users | ***7 pilot users***

ESC! users – e-mail questionnaire

Gender	Age	Profession	Owns another GSM phone?	Has another GPS or used GPS before?	Hobbies	What's best in ESC!
Male	34	Service engineer	Yes	Yes	Fishing, outdoor activities	Easy to use GPS
Male	41	Forestry officer	No	Yes	Fishing, hunting	combination of GPS and phone
Male	38	Entrepreneur	Yes	Yes	-	friend find
Male	*48*	*Research assistant*	*Yes*	*Yes*	*Fishing, hiking, boating*	*GSM + GPS*
Male	37	Farmer	No	No	Orienteering, skiing, photography	Good phone
Male	*33*	*Team leader service adviser*	*Yes*	*No*	*Cinema, reading, travelling*	*Features related to navigation, big screen*
Male	*37*	*Design engineer*	*Yes*	*Yes*	*-*	*Compass, maps and track in map*
Male	36	Hpac-planner	No	No	ADP, badminton, caravan	Big screen and GPS
Male	23	Computer engineer	No	No	Computers, telephones (GSM)	Maps
Male	54	Entrepreneur	Yes	Yes	Music, radio amateur, aquarium, snowmobile, sports	GPS and map service
Male	41	Architect	Yes	No	music, cinema	Navigation properties

Table 1. Esc! users who filled the e-mail questionnaire

ESC! users – interviewed

Gender	Age	Profession	Has another GSM phone?	Has another GPS or used GPS before?	Hobbies	What's best in ESC!
Female	*30*	*Researcher*	*Yes*	*Yes*	*Sports, dog, reading*	*Friend find –funny and useful*
Male	*54*	*Entrepreneur*	*Yes*	*Yes*	*Boating*	*Telematics and its exploitation*
Female	*28*	*Researcher*	*Yes*	*Yes*	*Movies, cafes, travelling, hiking, skiing, telemark*	*Collecting waypoints, map, distance metering, friend find.*
Male	*57*	*Car driver (taxi)*	*Yes*	*No*	*downhill skiing, gym, house building*	*Telephone properties*
Male	45	Sales director	Yes	Yes	Sailing, golf	UI, sending waypoints to another phone

Male	40	Head of the design department	No	Yes	Boating, swimming, cycling, skiing	Telephone properties, track in map
Male	30	Design engineer	No	Yes	boating, hiking, table tennis, voluntary sea rescue service	GPS and maps, NMEA
Male	30	Car driver	Yes	No	boating, hiking	maps, robustness
Male	38	Warehouse worker	Yes	No	music, photography, hiking	Maps
Male	26	Foreman	Yes	Yes	volunteer fire-brigade	Friend find
Male	38	Teacher	Yes	No	fishing	GPS positioning, maps

Table 2. Interviewed Esc! users

2.6 Main findings of the Interviews and the Questionnaire

In the opinion of ESC! users, the device was targeted at: 1) "relatively young men who have to do a great deal of travelling because of work" (male 34); 2) outdoor people with various hobbies. In fact they pretty much felt that the product was targeted specifically for them. Also comments such as "it is a great toy", "I am interested in all new technology" came up more than a few times in the questionnaire and interviews.

Users who had prior experience of GPS devices were inspired to have a phone and GPS combined in the same device. Some users of ESC! acquired the device because they had been thinking of buying a GPS for themselves. The integration was seen as a great idea and many users commented that it was now easier to utilise GPS in their everyday life because they could carry it at all times. However, many of the ESC! users also owned another phone for their daily use.

The presumptive usage of ESC! was realised. Users of ESC! used it when they were hiking (to find their way back to e.g. the car) or boating (e.g. navigation in the dark, finding familiar spots for fishing). Usage of the device to assist work was very common. Some users locate their customers or belongings (e.g. chain saw in woods) now as a routine.

Users use ESC! mainly for orienteering and marking waypoints. Other possibilities of GPS use (e.g. current speed, estimated time of arrival, distances, length of a journey) were seen in general as either very useful or at least very interesting. In general, users of ESC! commented that they utilise the device both for leisure and work.

Users who had tried Friend Find were expecting it to be very useful in various situations, but only a few had found a more established usage for the function (e.g. checking a friend's position when meeting him/her somewhere). More ESC! users and devices were hoped for to have more possibilities to utilise this function. Those who had tried Yellow Pages service (a third of the users) did like the idea but had not used it more than once.

Users found innovative ways of using ESC!: they used it in golf, for locating customers and for other positioning and measuring needs (measuring borders, marking and determining storm damages, wild oat marking, measuring acreage etc.). The presumptive usage was not wide enough for some users or it did not fulfil their needs for GPS. They were experimenting with the device in various environments and situations and probably had selected only the most useful practices for their usage.

Users of ESC! did mention some usability problems. These were e.g. map downloading, map presentation on the screen, zoom and short battery life. Price was also routinely commented as being rather high at the moment. Several ways of improving ESC! were pointed out. Users of ESC! wished to have e.g. colour maps, CD and mobile map downloading, WAP, GPRS, fast button for positioning and a rental service for the device. In spite of this, these users still thought ESC! was very good. They

liked the outlook of the device and in general, evaluated the device as being fairly easy to use and learn. They were very happy with the device and eagerly recommended it to others.

The usage culture of ESC! seems to be rather individualistic and innovative in this first stage of adaptation of the concept. Users share the same kind of pioneer spirit that allows them to tolerate many common problems that often happened with latest technological applications. Their way of handling the device is very experimental. They willingly share their knowledge with other ESC! users (e.g. on the web) and are quite loyal to the brand. Some of the first users of ESC! were clearly "Benefon-men". They had chosen Benefon instead of some more common brand because they value individuality over the masses and speciality over ordinary (e.g. some of them used a MAC instead of a normal PC even though it required extra work for the ESC! compatibility).

2.6 Discussion sites

There are several discussion sites on the web where users of ESC! can communicate with each other. Outdoor hobby and GPS discussion sites also have information on ESC! and an international Yahoo! Group discussion site specifically for ESC! has been created as well. There is also a Finnish discussion site for Benefon telephones and lots of communications to that site deal with ESC!.

Those who contribute on these sites are almost exclusively men. In the Yahoo! Groups, they seem to be very attracted by the idea of ESC! (combination of GPS and GSM) and have rather good knowledge of the technology behind the device. In the discussion site of Benefon telephones, there are basically two schools of arguments: those who support the idea of the integration of GPS and GSM and those who are against it. It seems that in this site, there are highly critical participants vs. ESC! users. The latter group reminds very much of the participants to the Yahoo! Group, and probably some of them actually visit both sites.

Discussion sites help the users in the following way: there are discussions about usability, comparisons with other devices, technical advice and information about available applications for ESC!. Those who contribute to these sites are very strongly technologically-oriented. They want to know and share their knowledge of the product's software (what version[1], how to make your own applications and e.g. how to find out the temperature of the battery[2]) and hardware (what are the components inside the product). They experiment and innovate with the functions and usage of the product in extreme conditions, and test e.g. the accuracy of the GPS and the reception of GSM in various environments.

Discussion sites are clearly an unofficial helpdesk. People share their experiences of the device and communication with e.g. service and vendors. These users are in general very happy with the device and recommend it eagerly to others. They clearly have previous experience of dealing with brand new products on the market and because of this, they probably tolerate well the problems that are typical to the early versions of the product (e.g. software bugs - software update).

2.7 Conclusions

Users. In our case, the ESC users were mainly men. Their age in the interviews was around 40, whilst on discussion sites it was probably a little bit lower. They did take interest in outdoor activities e.g.

[1] You get these values with *#0000#.
[2] Information on the battery punching *#battery#. Some users has used this feature as a thermometer: when the device and the battery are just turned on, the readout of the battery temperature is pretty close to the actual temperature of the environment.

hunting, hiking, boating and many had also tried GPS before. They were particularly keen on technology.

Usage. Presumptive users and usages of the product has been realised to be fairly similar to that the product introduction has presented. Technologically-oriented outdoor lovers have been the early users of the product. In ads and in the media, this kind of picture for the product is still strong. This kind of fairly strictly defined approach to potential customers has implicitly excluded implicitly a number of potential user groups from the market. This is of course reasonable in the sense that the users who do not possess the qualities (e.g. technical orientation, patience, good sight) that are considered to be needed (e.g. technical orientation, patience, good sight) will not have false expectations for the product. Both marketing and media have identified the same usage contexts for the product in the main. Interestingly, users of ESC! use it often as an assistant in their work, more than was emphasised in the marketing material. Possible environments to use the product were commented to be first of all outdoor cross-country areas or sea and lake environments. Usage of the device was very experimental (extreme conditions, testing technological features) and innovative (new usages for the product were invented).

Main features. The same features were listed as important in promotional material, the media and by the users: GPS and GSM combination, map interface, downloadable maps, Friend Find.

Safety is a justifying character to acquire this product. Media and promotional material identified safety as a key factor to justify acquiring the product. Also, the users willingly mentioned possible emergency situations where they could utilise the product as a safety device.

Positioning - no problem? The Friend Find application and Yellow Pages service were thought to be some of the key features of the product in the marketing material. In the media, Friend Find was given almost the same importance. Friend Find services were tried by many of the ESC! users. However only a few of them use it regularly. The case was pretty similar with Yellow Pages service and positioning in that connection. Based on these experiences, the users of ESC! did not see any problems in locating others or others locating the user.

Usability. The device was thought to be very usable for the targeted group by the users. Both the media and users said that the product was not very easy to use for everybody.

Price. Both the media and users said that the price of the product was suitable at the moment because it is something that has not been available before.

3 Location-based gaming

In a broad sense, gaming with mobile devices is not anything particularly new: in such traditional innovations as a dice or a deck of cards we already have an extremely functional mobile handheld gaming device per se. Nintendo released their first handheld game system “Game & Watch” in 1980, and has sold over 100 million GameBoy units since its introduction in 1989. Today, many games played with mobile phones or PDAs are more or less remediations of classical arcade and video games. In the following, we try to evaluate the new characteristics and challenges that location-based concepts can bring to the field of mobile gaming.

3.1 Levels of mobility in mobile gaming

The first phase of mobile gaming has been described as *entertainment of idle moments.* Many commercials picture a first-generation "mobile" player sitting on the tube or at a bus stop or waiting for a friend. As Lasse Seppänen has put it, "This is the core of mobile player behaviour: mobile gaming remedies moments of boredom when there's no access to better gaming devices. The result is a completely different pattern of playing – whereas traditional gaming consists of a few long sessions, mobile gaming is all about multiple short sessions." (Seppänen 2000)

In this context it is necessary to examine the definition of mobility somewhat more in depth. The character of mobility can be divided at least into two different categories. *Semimobile* refers to contexts where users and surroundings do not constantly move but wireless communication is the most suitable way to conduct business (hotels, cafes, public transportation). *Fully mobile* environment imposes more restrictions to the use because the user is performing other tasks simultaneously: for example s/he has to use a device while walking or driving a car. (Väänänen-Vainio-Mattila & Ruuska 2000, 179)

The definition of semimobile seems to fit in quite well with Seppänen's description of mobile gaming. On the contrary, location-based games are close to fully mobile since using a physical environment as the playground forces players to divide their attention between the device and the actual physical settings. One important additional aspect from the point of view of mobility is that a location-based game can actually force a player to move: for example to search for certain hot spots or to find or avoid other players. This kind of *"required mobility"* goes beyond the two-piece categorisation and adds a new level to the definition of mobility.

Furthermore, if we follow the description, mobile gaming situations tend to be occasional and of brief duration. Also, in this case some location-based games make an exception since successful gaming requires being in active mode as much as possible.

3.2 Location –based game types

Lately, the gaming concepts taking advantage of positioning and location information have brought new and interesting features to the nature of mobile gaming. From a technological point of view location-based games can be divided into three different groups: 1) games played with GPS receivers 2) concepts based on local area networks (e.g. WLAN) and proximity sensors 3) games based on GSM cell identification (Sotamaa 2002). In the following, we clarify the categories with several existing examples. The nature of the list is more illustrative than comprehensive.

The oldest games are based on using Global Positioning System (GPS) receivers that have been on the market much longer than mobile phones or PDAs. Theoretically, the playground for GPS-based treasure hunt games is the entire planet though standard GPS functions only outdoors. In ideal conditions, a GPS device can determine your location with the accuracy of a few meters but since the receivers normally have no communications features, these concepts do not support real time multi-user experiences. Today the hints and findings concerning different caches are reported mainly on the web.

- **Geocaching** (www.geocaching.com)

The basic idea is to have individuals and organisations set up caches all over the world and share the locations of these caches on the internet. GPS users can then use the location coordinates to find the caches. Once found, a cache may provide the visitor with a wide variety of rewards. A slightly different kind of approach based on the Geocaching idea is CacheAcrossAmerica (groups.yahoo.com/group/CacheAcrossAmerica/).

> "It's a great activity because you're outdoors, so it's beautiful, you get exercise, and the kids are motivated because there's something fun at the end," says Elaine. "They love the treasure-hunt aspect."

> Adds Brian: "I got hooked because it's an outdoor thing — which I love — and I'm a gadget geek. It's the best of both worlds."

Researchers in our group have also tried geocaching a few times. Last spring (2002), we searched and found one cache in Kilo, Espoo. Also two researchers have been with their families to search a cache in Kangasala this autumn (2002). Based on our experiences, it is very easy to understand that people who like outdoor hobbies are motivated by this kind of treasure hunting. There is kind of excitement in looking for the cache and finding it.

Interactivity with other users is established through the web site and in caches (you can leave something and you can take something, and from the logbook you see who else has been at the cache). Geocaching is growing in popularity all over the world. Caches could be found at the time of writing (autumn 2002) in 149 countries. In Finland the number of participants in Geocaching has been growing very quickly during the year 2002 (rising from 10 to 100 in 6 months) and they have also organised meetings in the autumn of 2002.

The usage culture of GPS devices in the context of treasure hunting is moving towards gaming and entertainment as opposed to the more traditional orienteering context emphasising safety and issues of control. Participants in Geocaching have been interested in being outdoor in some way or other. They have been e.g. hiking or picking berries before and have found GPS as an assistant in their outdoor hobbies as well.

It is not enough for most of us to just go and wander in the woods or roam a city. A purpose or a goal for doing something is important and it can be more easily justified when you can explicitly argue that it is part of your hobby. A new kind of motivator to be outdoors seems to be found in Geocaching. It gives you a kind of feeling of interaction - gaming with somebody - that seems to suit these group; you can do it very quietly, on your own - or you can choose to go on the treasure hunt with your friends and family. You can also have a very active role in a community (discussion on the web) and compete with others, or you can take part in the community more quietly

Motivators for Geocaching:

- outdoors - love of nature, interested in the environment (natural or built up) and its history
- technological orientation - sharing interest in GPS use (and usually also for other technological devices)
- competition - to find the most caches
- communality - virtual (on the web and at caches) or real (with your own group, or with other participants at their meetings)

The usage culture of the Geocaching players seems to be valuing health (exercise), nature (exercise in outdoors) communality (exercise in outdoors with family or friends) and internationality (global web, you can play Geocaching everywhere) . Orienteering (maps, co-ordinates) and GPS use is familiar to the player or the main player in a group (e.g. in family). Most players and main players of Geocaching appear to be men.

Geodashing (geodashing.org)
In each game, a large set of waypoints, called dashpoints, from all over the world is posted on the web. Dashpoint locations are chosen at random by computer, with all the unpredictability that it implies. Dashpoints might be in suburban neighbourhoods or in the middle of a wild area. Then, the race is on to see who can reach the most dashpoints before the deadline.

MinuteWar (www.seaotters.net/~scout/MinuteWar)

MinuteWar is a game that involves the capture of a flag using the whole world as the playing field and GPS receivers for navigation. Every player in the world uses his own local map, but all the maps are combined so that all players compete against everyone else at the same time no matter where they live. The maps are divided into squares. Each square is one minute of longitude wide and one minute of latitude tall. Each square contains a virtual flag. Visit the exact spot where the flag is located to capture the flag and control the square. Capture other players' flags by visiting the same spot they did, on their map or yours. Whoever captures the most flags and controls the most territory, wins.
The battle to capture these flags and hold these squares is MinuteWar.

GPS Drawing (www.gpsdrawing.com)
All the work has been made by actually travelling along the shapes using satellite navigation technology. The GPS drawing project was set up by Hugh Pryor and Jeremy Wood in 2000 after capturing a giant fish. The Gallery contains drawings that are part of an ongoing investigation into a method of digital mark making.

The concepts for the second game category are based on local area networks (WLAN etc.) and proximity sensors. The experiments produced so far are mainly outcomes of both academic and commercial research projects. These games utilise a limited area and can make physical locations, objects, states and locations of other players intrinsic elements of the game.

Pirates! (www.viktoria.informatik.gu.se/groups/play/projects/pirates/pirates.html)
Pirates! is a multi-player computer game that takes place in a fantasy archipelago setting, where each player is the captain of a ship. The players must roam a physical environment, the game arena, in order to explore the virtual game environment. As a player enters the proximity of an island, or another ship in the game arena, he or she has the choice of landing and explore the island or engage in battle, respectively. Furthermore, players must constantly be on the lookout for other players if they want to engage in or avoid sea battles or if they want to exchange information. The game is implemented to run on handheld computers connected to a Wireless Local Area Network (WLAN). A local server maintains and controls the virtual game environment and keeps a record of the events that take place in the game. In addition to the WLAN adapters, each handheld device is fitted with custom-made proximity sensors, used to determine the player' location in physical space. (for more details see Björk, Falk, Hansson & Ljungstrand, 2001)

Can You See Me Now? (www.canyouseemenow.co.uk)
CYSMN is a mixed reality performance that was staged on the 30th November and 1st December 2001 in Sheffield, UK. The game was played between on-line players (the public) and runners (game development staff). The runners were chasing the players and the players were supposed to avoid being caught. Each runner in the game was equipped with a handheld computer connected to a GPS (Global Positioning System) tracker. The handheld computer sent the runner's location from the tracker over a wireless network to people playing online. The positions of players online were passed back the other way and displayed on the screen of the runner's computer. (For more details see Benford, Anastasi & Flintham, 2001)

M.A.D. Countdown (www.madcountdown.de)
The developers call it "A mobile multi-player hybrid reality game" and it includes a dramatic doomsday storyline, time-pressure, enforced physical and virtual mobility and trust/risk tension between the players in the team. (For more details see Walz 2002)

Eerie (www.sics.se/eerie/index-en.html)
EERIE is a framework and a set of general tools for constructing electronic landscapes suitable for role-play or role-play-like events.

The third category of location-based games consists of the ones taking advantage of cell identification in GSM networks. GSM network-based locating is not as accurate as other alternatives but the

advantage is that cell identification does not require any new hardware or additional cards and the games can be played by using standard GSM phones. Because of the high penetration of mobile phones, the first large audience hit concepts are likely to come from this category.

Botfighters (www.itsalive.com/games/)
Botfighters is a location-based multi-user game that combines elements from roleplaying games and first person shooters. The next chapter includes a detailed case study on Botfighters.

Other projects:
For example, the Danish Unwiredfactory offers several different services that allow players to fight friends and enemies in a quest for zones (**BattleMachine**) and hunt and "dig" for treasures (**TreasureMachine**) with their mobile phones.

Based on our research, the basic genres of location-based gaming at the moment seem to be multi-user fighting, different kinds of chases, games of territorial conquest and types of treasure hunt. These basic genres can be combined and modified in various ways.

3.3 Case Botfighters

It is obvious that a mobile phone has its limitations as a gaming device. Since lately the displays have not supported any multicoloured visuals. Also the input methods are very limited. Some of the latest mobile phone models include a kind of joystick but in these cases also, it is not designed primarily for gaming. Likewise the basic communications protocols (SMS, WAP) are not designed for gaming purposes.

On the other hand a mobile phone has also some benefits in gaming contexts. Most people who own one carry it with them most of the time. A phone is primarily a communicative device that allows you to be in contact with other people. A medium that already carries within strong social habits can be seen to fit quite well into a multi-user approach.

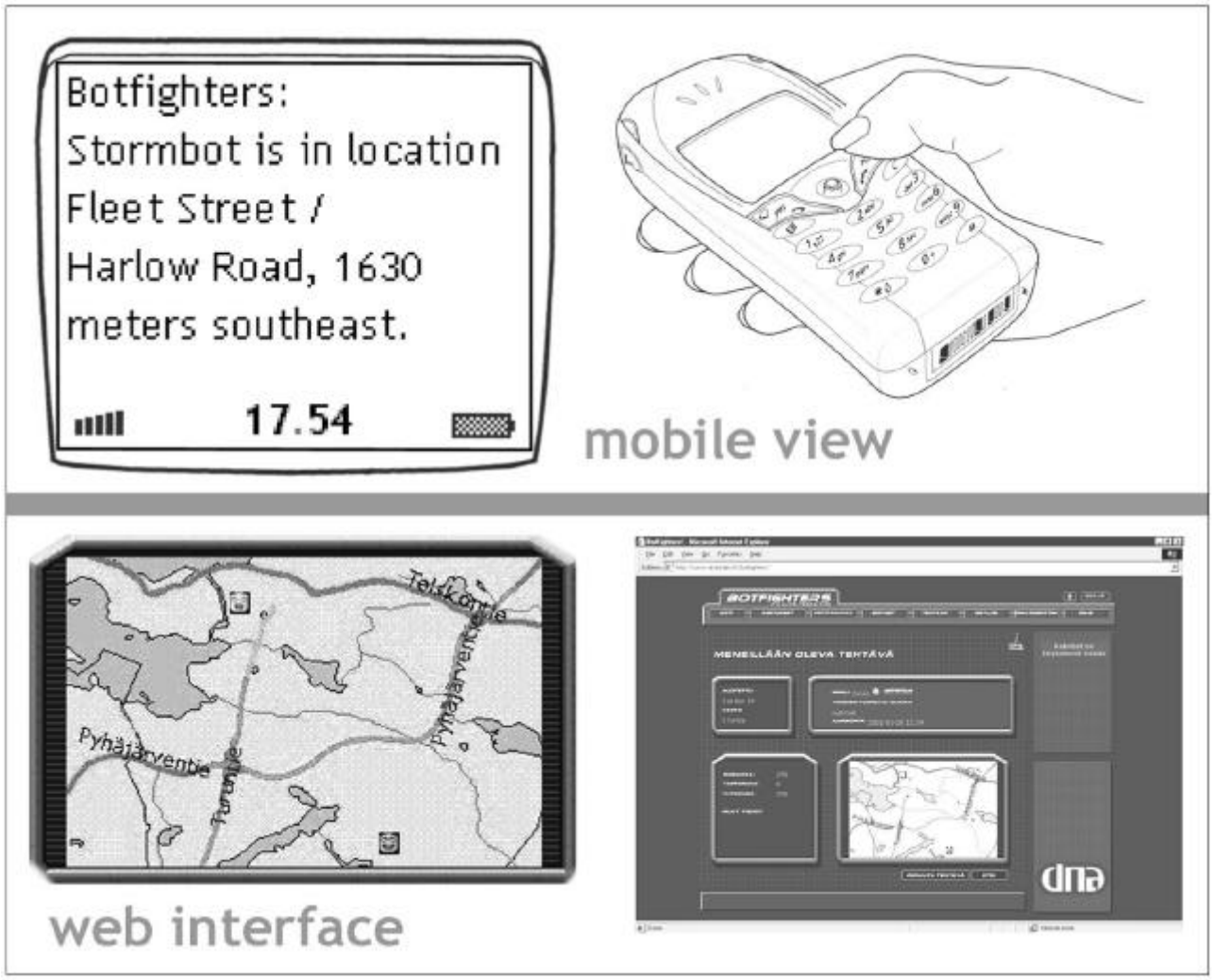
While landline phones are primarily associated with fixed locations, the identity of a mobile phone is connected to persons and changing contexts. (Ljungstrand 2001) You can make a call practically anywhere and the receiver can answer your call almost anywhere. In most cases it is even impossible to know the location of a receiver beforehand. Therefore it is very common to start a conversation with describing one's contextual situation: where are you? are you able to talk now? what are you doing? who's with you? etc. (Kopomaa 2000)

This kind of play with location makes mobile phone users more sensitive and more aware of the nature of different locations and contexts. The mobile phone etiquette is continuously redefined: it seems to be suitable to answer a phone call in such public places as a train or a bus, but what about at the movies? And it is perhaps not suitable to answer a call during a business meeting but for sure you can send a couple of text messages or emails. Therefore it seems that although people are able to use their devices almost anywhere, the significance of locations and contexts is only increasing.

The BotFighters game is advertised as the world's first location-based mobile game that takes advantage of mobile positioning and lets the users play against others in their vicinity by using a standard GSM phone. Botfighters is produced by Swedish company It's Alive! and it was launched in Sweden during the spring of 2001. As of October 2002, Botfighters can by played in Sweden (Telia), Ireland (Vodafone) and Finland (DNA Finland).

The basic concept of the Botfighters game is quite simple. The mission of the game is to locate and destroy other players (bots), and when a target is destroyed, the player earns credits and moves up on the high score list. Game functions are divided between the web and mobile interfaces. The web

interface is used to build and update your robot and follow up the situation of the game in general. You can see your own position and that of others by area or in all together category. You can also follow up the combats on the web. Combats are updated to the web to be followed by all registered users. The mobile phone is used for the battles out on the streets. Picture 2 presents more information on the interfaces.



Picture 2: Botfighting interfaces

To choose a particular opponent to a target, players send a text message with the content “hunt” followed by the name of the opponent. Locating the target happens with the message “search”. Every text message command produces a feedback message giving information on the proximity between players (see Figure 1). When the opponent is within range, the actual battle starts with the “shoot” message. Simultaneously, the target is aware that s/he is being hunted because of the radar warnings sent by the system. This allows opponents to choose whether to take part in the shootout or run away and organise a counterattacking action. The GSM network cell identification is used to determine whether the users are close enough to each other to be able to hit. The damage caused depends on the type of weapon used, the efficiency of the target’s shield and other preferences held by the players.

Researchers in our team acquired suitable SIM cards for the game and registerd to Botfighters. There are something like 1001 registered players on the web for Botfighters, but only some of them take part actively in the game. The game seems to be targeted for fairly young male users. It has similarities with computer games and science fiction movies in its design. The outlook of the web site is rather gloomy and even decadent. The follow up comments of the combats written by the webmaster are rather brutal and/or funny depending on the interpretation. Similar comments are sent to the mobile devices of the actual fighters. We played Botfighters mainly in Tampere. We also played the game

when visiting Helsinki. One day we made a trip to go to play in Helsinki by car and we played also in Hämeenlinna and Riihimäki on the way.

Experiences of the game were:
Playing is guessing. If you play the game mobile without web access, it is probably wise to have a map with you. If (and that is usually the case in unfamiliar environment) you don't know the places/positions were the base stations are, then it is pretty hard for you to know which way is the best way to attack or withdraw. The nature of the hunt is of course very different in city centres, where the base stations are more densely located than in e.g. the countryside where the areas and distances of the base stations are noticeably greater. However, only through solid experience of gaming is it possible to react quickly in combat.

Playing is random. A small number of actively participating players were found in Helsinki and Hämeenlinna (the situation seems to be pretty similar all over Finland). Many of the registered players were in pause mode and it seemed they had been on that mode for a long time.

Playing is different on the move and when still.
The faster you move, the harder it is to play. When you move in a city area, your cell id position moves pretty quickly as well. Based on our experiences as novel Botfighters, it was really hard to chase others. We had a car, so we moved fairly quickly from one place to another. Anyhow, this did not help us to avoid being shot or shoot and run away quickly. In Helsinki we did not get any points, but in Hämeenlinna we found a few easy targets, which saved our day. Playing when still is an other kind of experience. It can be really frustrating if there is no activity nearby and you just wait for others to come to the shooting range. If you have web access in your office however, it could be nice to follow some players moving over the day - and then shoot them if they come too close.

Playing experience is different if you are alone or with somebody. Sharing the playing experiences (hunt, withdraws, wins and losses) with friends was fun. It is also recommendable if you chase another bot by car. Of course, different kind of personalities may choose different kind of playing modes, or play the game differently when in groups or alone.

Positioning and identifying players. In the game you can locate other players by the accuracy of the nearest base station where the mobile phone is connected to. In principle, players know only the identity of the botfighter, not the real one. In practice however, players might also know some players' real identity (e.g. friends) and you could follow the approximate locations the other player has visited also for another purpose than playing Botfighters. Naturally you can stop playing whenever you want and others can no longer locate you. This kind of positioning did not bring up any ethical discussion about the practice. Positioning others and others positioning the player seems to be unproblematic in the game context.

Motivation to play. One clear motivation to play Botfighters was the competition and awards built around it. Of course, pure competition with a ranking list can also motivate most of us to earn some points. Also, communality (virtual or real) can motivate some to take part in the game.

Cost of playing. Naturally, in December 2001, when playing the game was free, the number of players and actions at play were noticeably larger than after this free period ended. It is probable that price is one of the key limiters to active playing.

Innovations. Botfighters has been used as part of the self-made safety alarm system in cars.

Usage culture. It seems now that there are small groups of players in a few areas of Finland. Helsinki seems to be also the capital of the Botfighters and it is likely that in Helsinki you will be able to find individual players (residents and visitors) as well as some groups of friends that have an interest in the game. In other parts of the country, there are something like approximately 10 players per area and you can find between 5 and 10 active areas. Players of the game seem to be fairly young males (12 to

18) who share the same kind of culturally-modified factors in their life (computer games, hip hop or metal music etc.). It seems clear that this game has been targeted to be more a phenomena of subcultures rather than for larger audiences. Whether some groups take to this game as part of their culture and modify it somehow remains to be seen.

3.4. Conclusions and further discussion

Location-based games belong to the category of pervasive gaming. Pervasive can be defined as something encompassing and always present. In other words, the game never stops but surrounds the player 24 hours a day. In pervasive games, the game world is constructed on top of the real world: the game world exists beside the everyday environment. Pervasive games can also manipulate the moments and periods of gaming – for example with phone calls or SMS messages in the middle of the night.

Thereby, it seems that using streets and other physical environments as a game board not only questions the definition of gaming but also brings new nuances and levels to the production of everyday space. If the mobile gaming ideal is to free players from the chains of time and place, location-based gaming on the contrary operates through creating new meanings to familiar locations. This also forces us to consider how our society should treat games that have an immediate influence on real life actions. Should location-based games be rated as adult only content if they can for example encourage children to places beyond where they are permitted to wander (Meyers 2001)

4 Evolving usage cultures of personal navigation

Exploring the existing usage cultures gives us important information about the process used by people to adapt new products and services to their everyday life. It enables us to identify human context-dependent needs and requirements and understand the usage of the products and services in social contexts. We can see how products are modified and transformed as physical and symbolic objects. This can give valuable clues for supporting research and development of new customer applications. Through observing the ways people utilise their products at the moment, we can apply more holistic ways to understand the user experience: how users are developing and experimenting new ways of acting in a particular situation, and how users are inventing new usages and ways of fulfilling their needs. In best practice, we can transfer this information to the next generation products or let us invent something totally new for the customers.

As it has also been found in the cases we have presented, the adaptation of totally new products and services takes time. Early adapters (technically-oriented males) are the first few who approach the novelty and test e.g. the device (what can it do, where can it be used). They use it in various ways and experiment with it (how well does the device work technologically). They are enthusiastic about the product; they want to know what the error margin in the measurements will be or what software version is in it. This is the first stage in the formation of cultural usage.

Little by little, more and more users have possibilities to get acquainted with the product. It is cheaper than at the beginning, it is more reliable and it has been tested in real life. Initial users have invented good real-life usages for the product, and/or the vendors have invented new ways of introducing the product to various potential users or they have modified the product to make it more suitable for potential user groups. At the mainstream stage, the product or technology is adopted by large amounts of users. Masses (generic culture) use the product or service routinely in their every day life. There are many diverse usage cultures to be found for the same product. It is used in the simplest way possible and at the same time different users use it in a most complicated way. Segregation of the users has

already started and something new and unseen usages for the product modification is invented by the special user groups and by the developers and researchers (subcultures, differentiation). At the moment (3/2002) the use of personal navigation products and services is very much presumptive usage by the early adapters, but there are also innovations, especially with GPS. The traditional ways of navigating will last, at least until the newer ways are improved, but certainly new personal navigation products and services will be adopted sooner or later as commodities by consumers (beside professional usage).

User experience of the product or service is composed of the usage of the product (usability, utility, functionality) and of the presentation of the product (showing it, status, fashion) (Scneider-Hufscmidt et al. 2001). So defined user experience is a culturally-defined usage of the product in a particular social context. Then the meaning of user experience is also in a way to isolate oneself from, or to attach oneself to, the group or crowd. In this perspective that the product may become general or may attain the intended market segment, it should be usable, suitably priced and socially and culturally acceptable. New products and services for personal navigation are interesting because they offer us example of how different can the meaning of usability, introduction, outlook and price be. For early adopters, usability is a challenge - too usable and too complete, the product is not very interesting. Early adopters know that the latest technological applications are not cheap - they willingly pay more to be the early adopters. A suitable outlook of the product for the early adopters is a professional kind of look or even maybe in some cases, a somewhat unfinished appearance is accepted. If these requirements for the product are fulfilled then the early adopters accept the product socially (product for the first adopters, for a small number of users) and culturally (whose culture is rather individualistic and isolated from general usage culture).

New products have teething problems (or benefits in someone's opinion). Consultants of User Interface Engineering have defined four stages of market maturity. We try to place some examples of personal navigation and emerging usage cultures in this process.

The first stage of the process is the introduction of the product. It could be called 'Newest new - *Raw Iron*'. This is when the new usage cultures are emerging and evolving. It is started usually by a technology push. The outcome of this stage is a new concept, with a very high price. The usability and reliability of the product are not the main issues at this stage. Early adapters are keen to experience the new product and are tolerant of imperfections and usability problems.

The second stage of the process is '*Checklist Battles* - terminating the bug'. At this stage, usage cultures are modified, but user groups are still pretty small in numbers. Competitors are emerging in the field of technology. The operationality of the product and including many features is important. The focus of developers is on adding new features and fixing bugs. At this stage, usability means that the product has features that are assumed to meet the requirements of the target group. Customers expect a fully operational product and will pick up the one with the most features. Specific guidance and courses are arranged for using the product. Competition is getting harder. The product should evolve faster than those of competitors to retain its position.

At the third stage, '*Productivity War*- utilization', usage cultures for the product are established and solid. The products of competitors are rather similar. Customers expect advanced features and reliability and are willing to pick the product that is the easiest to use. Usability is vital at this stage to attract more users than competitors (easiness, flexibility, time saving). On-line help and fast update are offered to the users. At this stage, the product is suitable and compatible in various environments. One of the main goals is in minimising the technical support to reduce expenses

At the fourth stage, '*Transparency* - refinement', the product is seen as a commodity - everyday and ordinary usage. Developers and lead users still innovate and come up with new ways of using the product, but this is the stage when something totally new has to be innovated because:

- competitors offer almost identical products
- price is a key factor, usability self-evident

- production costs must be kept as low as possible

The product is invisible at this stage, and available for everyone. The process of starting to design new products has to begin.

Stage	User requirement	Usability requirement	Developers focus
1	The basic capability	The product works	Technical issues and delivery, technical support. Making the product work.
2	The best set of features 	Having the right functions	Adding new features and fixing bugs
3	To get their work done better and faster	Easy to learn and use, fast and powerful	Making the product easy to use. Performance support, reducing technical support costs
4	Price - lowest cost	The product is invisible.	Reducing still costs and/or seeking new markets.

Table 2. Personal navigation and market maturity

In table 3 is presented our guess of how some products and services for personal navigation might be placed in this process of market maturity. There are so many different kinds of products and services that it would be too strong to say that none of the products and services for personal navigation have gone through this cycle. However, it is probable that there are many products that could be categorised somewhere between stages two and three. It remains to be seen which of them go and are pushed through all stages.

5 Conclusions

Usage culture refers to the collectively agreed or modified way of using a product or a service to fulfil some specific human need. Usage cultures define the present use of personal navigation devices and services. However, we must remember that the users continually reform themselves at the different stages of the community and society. In the early phase of evolving cultural usage for the product, the community and individuals are negotiating basic 'rules' for the use of the product. These rules or

models for using the product are affected both by its presumed usage and the context of use, and by the inventions from the users themselves as a group or as individuals.

The product has a presumed, guided and desired model of usage, but people who use the product modify it culturally so that it suits their mental and social world. People may use the same product or service differently in different kinds of situations and with different groups (e.g. work usage, family usage, interest group usage) and sometimes people may not take the product into use at all if it is not suitable or formable for their everyday life.

Personal navigation is a concept that tries to fulfil human needs for wayfinding, route planning, safety and location-based services and entertainment. Needs are not invented or new but it is the novel way of delivering these experiences and services which is something that has not been experienced before. Novelties (products, habits, way of life) are produced, adapted, modified and fade continually and the users' experience of these novelties is determining their destiny on the route of the product's life cycle. The golden key to the wisdom of consumer behaviour is to see, hear, listen and learn from how people have done things before and how are they doing things at the moment. After this, we can only guess with the help of the potential users what kind of solutions could solve their problems best or make their life more comfortable.

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Appendix 1

Dear user of Benefon ESC!
We thank you for participating to our research!

All the collected information will be used completely confidentially.

Background information

Year of Birth: _____ **Gender:** Male ☐ Female ☐

Residence: _____ **Education:** _____

Profession: _____

Hobbies: _____

1. How long you have used Benefon ESC! ? _____ months

2. Why did you buy Benefon ESC ?

3. Have you used any other GPS devices before ESC, if you answered yes, what devices?

4. To whom, in your opinion, the Benefon ESC was pointed at first?

5. Value following statements in your point of view and answer by ticking the right choice

	Totally disagree	Nearly disagree	Some-what disagree	Some-what agree	Nearly agree	Totally agree
I have been satisfied with functioning of ESC	☐	☐	☐	☐	☐	☐
I have been satisfied with appearance of ESC	☐	☐	☐	☐	☐	☐
The use and properties of ESC have been easy to learn	☐	☐	☐	☐	☐	☐
It is easy to use ESC	☐	☐	☐	☐	☐	☐
I know almost all ESC's GPS functions	☐	☐	☐	☐	☐	☐
I know almost all ESC's GSM functions	☐	☐	☐	☐	☐	☐
I know well what kind of services I can use with ESC	☐	☐	☐	☐	☐	☐
Loading maps to ESC goes without problems	☐	☐	☐	☐	☐	☐
I carry ESC always with me	☐	☐	☐	☐	☐	☐
ESC has been usefull in my work	☐	☐	☐	☐	☐	☐
ESC has been usefull in my free time	☐	☐	☐	☐	☐	☐
I could recommend ESC for other people	☐	☐	☐	☐	☐	☐
I'm going to be ESC user also in the future	☐	☐	☐	☐	☐	☐

6. At the moment do you have other gsm-phones / gps-devices in use, if yes, what?

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7. Does someone else use your Benefon ESC? Yes ☐ No ☐
Who? _____

8. Do you know other Benefon ESC users? Yes ☐ No ☐

9 Do you follow some newsgroups related to ESC? Yes ☐ No ☐

10. Have you introduced ESC to other people? Yes ☐ No ☐

11. Have you been contact with Benefon or Arbonaut HelpDesk? Yes ☐ No ☐

12. Have you had any problems with ESC, if yes, what kind of problems?

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13. In your opinion what has been the best feature of ESC?

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14. In your opinion what has been the worst feature of ESC?

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15. If you want to tell us more about your experiences with Benefon ESC, you can write them down below. For example in what kind of situations you have used ESC's different functions (map, compass, coordinates, waypoints, friend find, etc.)

Thank you for your answers!