



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



## **Deliverable 2**

### **Products and Services for Personal Navigation – Classification from the User's Point of View**

Version 3.2

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## Tiivistelmä

Yksi KEN –projektin tehtävistä on ollut luonnostella käyttäjän näkökulmasta henkilökohtaisen navigoinnin alaan kuuluvien tuotteiden ja palveluiden luokittelua. Luokittelun tavoitteena on ollut eräänlaisen tuoteselostemallin luominen. Tuoteselosteen ajatuksena on helpottaa toisaalta kuluttajia ja potentiaalisia tuotteiden käyttäjiä vertailemaan erilaisia tuotteita ja toisaalta auttaa tuotteiden kehittäjiä ja tarjoajia kuvaamaan tuotteitaan yhdenmukaisella, kuluttajan näkökulmaa myötäilevällä tavalla .

KEN –projektin luokittelu –osion ensimmäisessä vaiheessa tunnistettiin ne erilaiset ulottuvuudet, käsitteet ja näkökulmat, joita erilaiset paikannukseen liittyvät toimijat (teknologian kehittäjät, standardit, palveluntuottajat, tuotekehittäjät, markkinointi jne.) toivat esille oman toimintansa kannalta. Ensimmäisessä vaiheessa tunnistetut dimensiot kiteytyvät seuraaviin teemoihin: käyttäjä, käyttäjän päämäärä, ympäristö, laitteet, teknologia sekä palveluiden erityispiirteet.

Luokittelun toisessa vaiheessa suunnattiin näkökulmaa erityisen tuoteselostemallin rakentamiseen. Tuoteselostemallin avulla henkilökohtaisen navigoinnin tuotteita ja palveluita kehittävä ja loppukäyttäjille tarjoavat tahot voivat paremmin huomioida potentiaalisen kohderyhmänsä tietotarpeet hänen tutustuessaan tuotteisiin joko mainosten tai tuote-esitteiden (ja -esittelyjen) avulla. Tuoteselostemalli käyttäjän näkökulmasta on rakennettu kysymyslistan muotoon. Kysymyslista edustaa niitä erilaisia tietotarpeita, joita tuotteeseen ensi kertaa tutustuvalla henkilöllä on mielessään oman taustansa ja mahdollisen tuotteelle ajatellun käyttötärpeensa mukaan. Kysymyslistan on tarkoitus myös herättää pohdintaa tuotteeseen liittyvistä mielikuvista erilaisten kohderyhmien kannalta.

Luokittelun kysymyslistaa on testattu (huhti-toukokuussa 2002) kysymällä navigointiin liittyvän tuotteen tuotekehittäjiltä ja markkinoijilta viisi peruskysymystä omasta tuotteestaan (tuotteesta, jota henkilö on ollut kehittämässä tai markkinoimassa). Kysymykset olivat: Kenelle tuote on suunnattu (Kenelle tuote on sopiva)?, Mitä käyttäjä voi tehdä tuotteella?, Missä tuotetta voi/ei voi käyttää?, Mitä käyttäjän tulisi tietää tuotteeseen liittyvästä teknologiasta? sekä Mitä erityisominaisuuksia tuotteessa on?

Kysymyslista testattiin myös muutamilla käyttäjillä, joilla ei ollut aiempaa kokemusta uudeltaisista paikannuslaitteista. Testauksella varmistettiin, että kysymyslistamme kartoittaa mahdollisimman hyvin uuteen tuotteeseen tutustuvan henkilön mielessä olevia kysymyksiä. Testauksen avulla saimme myös selville keskeisimpiä kysymyksiä joita erilaiset kuluttajat ensimmäiseksi pohtivat harkitessaan uuden tuotteen hankkimista tai käyttöönottoa.

Tuoteselostemallin mukaiset pääkysymykset näyttävät olevan sopivan yleisiä, jotta niiden pohjalta voidaan suunnitella tuotteen kehittämistä ja markkinoimista oletetuille kohderyhmille. Tärkeää on kuitenkin huomata, että vastaukset näihin kysymyksiin tulee luonnostella kulloinkin kohderyhmä mielessä pitäen. Kysymys-vastaus –menetelmän käyttäminen sellaisenaan tuotteiden esittelemisessä voi antaa kuluttajalle liian hajanaisen kuvan tuotteesta. Potentiaalisten käyttäjien kannalta hyvä tapa esitellä tuotetta ja sen käyttöä on tuotteen todenmukaisen ja tilannesidonnaisen käyttötarinan rakentaminen. Käyttötarina voidaan tarinan muotoon sijoittaa vastaukset niihin kysymyksiin, joita potentiaalisilla kuluttajilla on mielessään, kun he arvioivat tuotteen sopivuutta omiin tarpeisiinsa.

## Abstract

One of the tasks of the project Key Usability and Ethical Issues in the NAVI programme (KEN) is to elaborate a common classification of the products and services for personal navigation from the user's point of view. The classification can be used as a basis for trade descriptions of the products. The trade description helps, on the one hand, the customers to compare different products and, on the other, the service providers to describe their products in a consistent way. Furthermore, the classification helps in defining common terms for new concepts. The classification will also help in targeting our usability and ethical guidelines at different purposes and at different kinds of systems.

This report introduces the dimensions needed in the classification: the user, the goal of the user, environment, equipment and service characteristics. Then we build a trade description model based on the classification. The trade description model introduces the personal navigation service or product to the user. The model is based on questions that could be asked by a buyer or a first-time user of the product. The provider of the navigation product can describe the product to the user by answering these questions.

The table below illustrates the main questions included in the trade description model.

<i>Classification</i>	<i>Trade description</i>
User	Is this product/service suitable for me? <ul style="list-style-type: none"> <li>✓ Targeted specially for a certain user group</li> <li>✓ Targeted only for a certain group</li> <li>✓ Accessibility for disabled users</li> </ul>
User goal	What can I do with this product / service? <ul style="list-style-type: none"> <li>✓ Locate myself</li> <li>✓ Be located by other people</li> <li>✓ Locate other people</li> <li>✓ Track my property</li> <li>✓ Get route guidance</li> <li>✓ Find and use services near by</li> <li>✓ Get help in emergency situations</li> <li>✓ Have fun</li> </ul>
Environment	Where can/cannot I use this product/service
Equipment	What do I need to know about the technology?
Service characteristics	What specific features does this service include?

This report is the third version of Deliverable 2 by the KEN project. We have now had brief evaluations of the trade description model with both designers of technology and end users. The trade description model seems to work as such but it is essential that the answers to the proposed questions are targeted according to the end user group. Furthermore, the answers as such give quite a fragmented impression of the product. Most answers could be integrated inside a story that describes the product in real use and in situations familiar to the target end user group. In this way the description is easier to piece together and the user can assess if (s)he could utilise the product in his/her everyday life.

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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 included in the NAVI programme. Together with the NAVI projects, we are identifying and solving usability and ethical problems related to personal navigation.

One of the tasks of the KEN project is to elaborate a common classification of the products and services for personal navigation from the user's point of view. The classification can be used as a basis for trade descriptions of the products. On the one hand, the trade description helps the customers compare different products whilst, on the other, it helps the service providers describe their products in a consistent way. Furthermore, the classification helps in defining common terms for new concepts. The classification will also help us in the KEN project to target our usability and ethical guidelines at different purposes and at different kinds of systems.

It has become obvious that one classification will not fit all occasions - a stringent classification from the user's perspective may not be functional for a product developer and vice versa. Therefore our approach has been to identify dimensions on which the classifications can be built. Parallel classifications will be needed for different purposes, and these classifications should be in a meaningful relation to each other.

Our aim is to find a classification that is neither too specific nor too general. A classification that is too specific will soon be outdated as markets develop, and does not do enough to clarify the picture by merely listing all the existing services. On the other hand, a classification that is excessively broad does not help anyone. The objective is thus to find a classification that is comprehensive and encompasses all the actual products that have already come on the market or are emerging on the market. Our purpose is to produce a classification specifically from the user's point of view.

This report presents two kinds of classifications. The basic classification of the main dimensions of navigation products and services can be used when describing this application field in general. The other classification is a trade description model, designed for the buyers and users of navigation products. This model includes questions that need to be answered when describing a navigation service or product, i.e. what the product is and what can it be used for.

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

## 1.2 Scope

The first two versions of this report defined the dimensions of a classification for the products and services for personal navigation. We then introduced a trade description model for navigation products and services. The trade description model can be used as a checklist when writing product descriptions or manuals on how to get started.

This report is the third version of Deliverable 2 by the KEN project. We have now conducted brief evaluations of the trade description model with both designers of technology and end users. This version of the report updates the previous versions with the results of these evaluations. We also assess how the trade description model could be utilised in practice.

## 1.3 Definitions, Acronyms, and Abbreviations

ISO	International Standardization Organization
LBS	Location-Based Service
PN	Personal Navigation
PNS	Personal Navigation product or Service
TICS	Transport Information and Control System
UMTS	Universal Mobile Telecommunication Systems

The terms related to personal navigation are defined in the Vocabulary of Positioning, (Tekniikan Sanastokeskus, 2002).

## 1.4 Overview

Personal navigation will introduce different kinds of products and services both for consumer and professional use. A navigation product can be an independent appliance that includes the necessary hardware and software for navigation tasks (e.g. a car navigation system). A navigation service can be provided on different user appliances, either mobile (e.g., mobile phone) or fixed line devices (e.g., PC). In the following, we use the terms products and service in parallel, meaning a product *or* a service.

From the user's point of view, the navigation products and services will support the following user goals amongst others:

- ✓ Locate oneself
- ✓ Locate other people
- ✓ Be located by other people

- ✓ Locate moving objects
- ✓ Get route guidance
- ✓ Find and use nearby services
- ✓ Get help in emergency situations
- ✓ Have fun

Our starting point is an analysis of the ways in which different actors currently classify the products and services for personal navigation. Based on this analysis, we present the main dimensions of navigation products and services. The classification includes six categories: 1) route guidance 2) interpersonal navigation 3) locating moving objects, 4) location-based services, 5) emergency services and 6) entertainment. This kind of classification is useful when describing the application field. It can also be used when targeting usability design guidelines for different navigation products. This classification is presented in chapter 2.

The classification is not suitable for the buyers and users of navigation products. They will need a trade description that clearly explains what the product is and what can it be used for. We have "translated" the classification into a trade description model for the users. The trade description model lists questions that the user needs an answer to when buying or using the product. The trade description model is introduced in chapter 3.

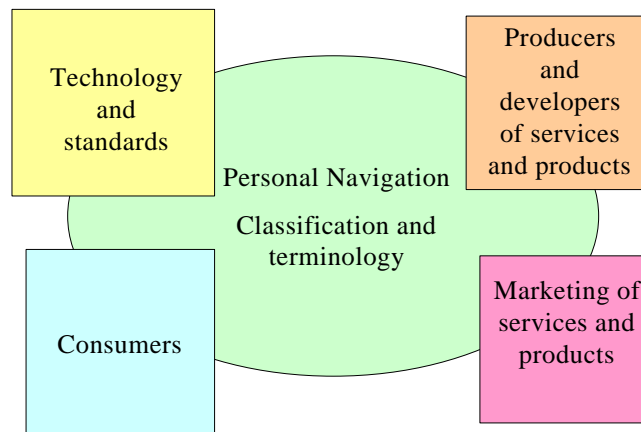
This report is the third version of Deliverable 2 by the KEN project. We have now conducted brief evaluations of the trade description model with both designers of technology and end users. The evaluation results are presented in chapters 4 and 5, concluding with an analysis of how to utilise the model in practice.

## 2 Classifications of Personal Navigation Services

Everybody classifies things or has to deal with ready-made classifications in everyday life. Classifying things and matters is a fundamental feature of a human being. Classification and taxonomy are also basic human requirements for interpersonal communication. When we are watching television, somebody probably prefers rather action than drama. Or if we are keen on spectator sports we perhaps are not interested in everything but want to select e.g., football. *"Classifying is an everyday activity for most people. When we talk about sports, most of us make distinctions regarding soccer, swimming, etc. First, we usually divide sports into two broad groups or classes: individual sports and team sports. And we often classify sports according to seasons, and according to whether the sport is one that we play or watch."* (Kimball 2000) It is not unusual; however, to identify conflicts in different classifications or overlapping categories in some taxonomies. In fact real world categories have in many cases fuzzy boundaries. Classification is always an agreement and it takes time that the agreement gets distributed widely enough and then generally accepted. Thus the agreements, like language and culture in general, are in continuous alteration; they are negotiated in everyday communication of people. We should remember that classification of things is a culturally and socially defined matter but still in some occasions we can find even extremely individualistic classifications of things.

Classification is also one of the basic things in trade and services. The trade description helps, on the one hand, the customers to compare different products and, on the other, the service providers to describe their products in a consistent way. The classification of the

products and services is successful when both the producer and the customer feel comfortable with it. A man-made taxonomy of services may fail at first and this can cause harm to the relationship between e.g., the service provider and the customer but even bad classifications can be tolerated and learned if there are no other choices and the need for service is obligatory.



*Figure 1 Different actors affecting the classification and the terminology of PN*

Keeping in mind that our purpose is to be a link between the technology and the users we have now updated our own classification to include six categories: 1) route guidance 2) interpersonal (community-based) navigation 3) locating moving objects, 4) location-based services, 5) emergency services and 6) entertainment. This kind of basic classification is useful when describing the application field and targeting usability design guidelines for different navigation products. It identifies the major categories of different kind of user experiences in using PNS. However, the classification is not very useful for the buyers and users of navigation products. They will need a trade description that clearly explains what the product is and what can it be used for. The trade description will define the basic classification of the product; who can use it, for what purpose and where. Thus the trade description will answer to the basic questions of the customer when buying or attempting to use PNS.

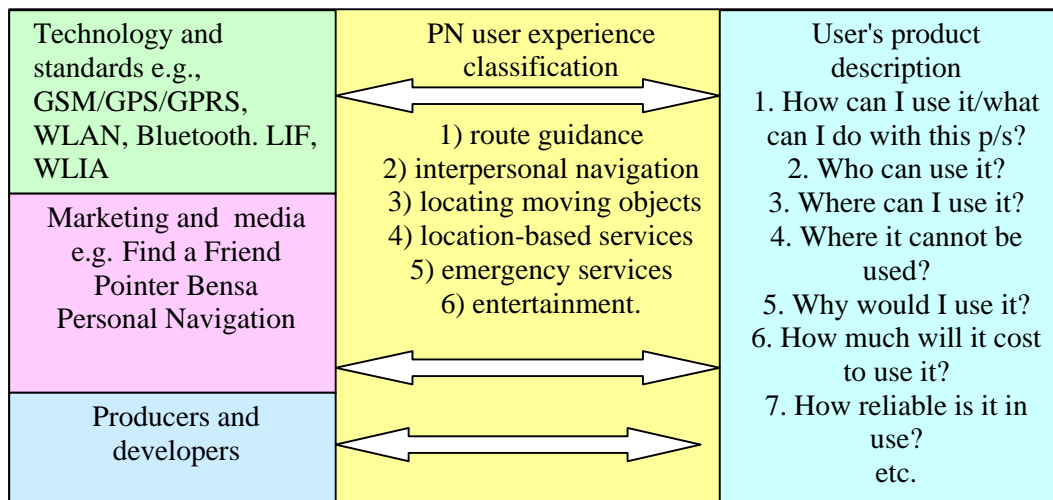


Figure 2. Different perspectives processing the dimensions of PN.

As more and more new technology, products and services are developed there is a need to supplement and rebuild taxonomies for the services. Sometimes it is even necessary to create a new classification of products and services for certain purposes. The classification of services that use location information is still in flux, and there are numerous classifications or more like descriptions from different points of view. Different parties use a little bit different terminology and classification derived of their background and goal.

### 3 Dimensions of the classification and the preliminary trade description model

In this chapter we will present the dimensions for the classification that we have identified. The choices for the dimensions are based on the information presented in chapter 2 and the ISO definition of context of use. We also present a preliminary trade description model by describing the dimensions of the classification by questions that the buyer or the user of the product might ask.

Analysis of the existing classifications suggests that there are two main criteria based on which the products and services are usually classified. The most common basis for classification appears to be the *user's goal* – what the user is trying to achieve by using the service. Another used approach is to offer services in terms of *user groups and their characteristics*. This way of presenting the services intends to answer to the needs of particular somehow limited user group.

According to ISO standard 9241-11:1998 "Ergonomic requirements for office work with visual display terminals – Guidance on usability" (ISO, 1998), the context of use of a product or service consists of four factors: 1) the user, 2) user task(s), 3) the equipment and 4) the environment. These basic dimensions of the classification raise four basic user questions:

1. Is this product/service suitable for me?
2. What can I do with this product / service?
3. Where can/cannot I use this product/service
4. What do I need to know about the technology?

In addition, to differentiate individual products, the user might ask (or the seller would like to answer) a fifth question:

5. What specific features does this service include?

In the following, we will analyse these five questions in chapters 3.1 to 3.5. In each chapter we will identify complementary questions for the basic question. Then we will conclude with the preliminary trade description model in chapter 3.6, in the form of a question list.

### **3.1 Is this service suitable for me? (User)**

During the design process of the service it is important to decide to whom will the service be targeted. The better the user group is identified the better the service meets the needs of those users. When the user is planning to take into use a navigation device or service he/she should clearly be informed if the product or service is suitable for him/her. Suitability depends mainly on the background of the user (e.g., education, profession, hobbies) and properties (e.g., psychophysics). The user should be informed what kinds of abilities or skills are needed to use the service (e.g., language skills, former skills on navigation, ability to use PC or Internet).

Some navigation services may be targeted especially for certain professions, hobbies and modes of travel (walking, cycling, driving...). The Homo Mobilis model (Figure 3) by the NAVI programme (Rainio, 2000) defines different characteristics of the users that can have an effect on the selected navigation service or product.

On the one hand, the psychophysical status of the user may require different adaptations to the navigation product or service. On the other hand, there may be specific navigation products and services designed especially for a predefined user group, e.g. visually impaired users or users with memory disorders.

One given service can have users that use the service with different interfaces and with different goals – for example, a personnel management service will appear different for an individual field worker (using his/her mobile terminal) and for a supervisor who uses the service to track the movement of personnel with a fixed line terminal.

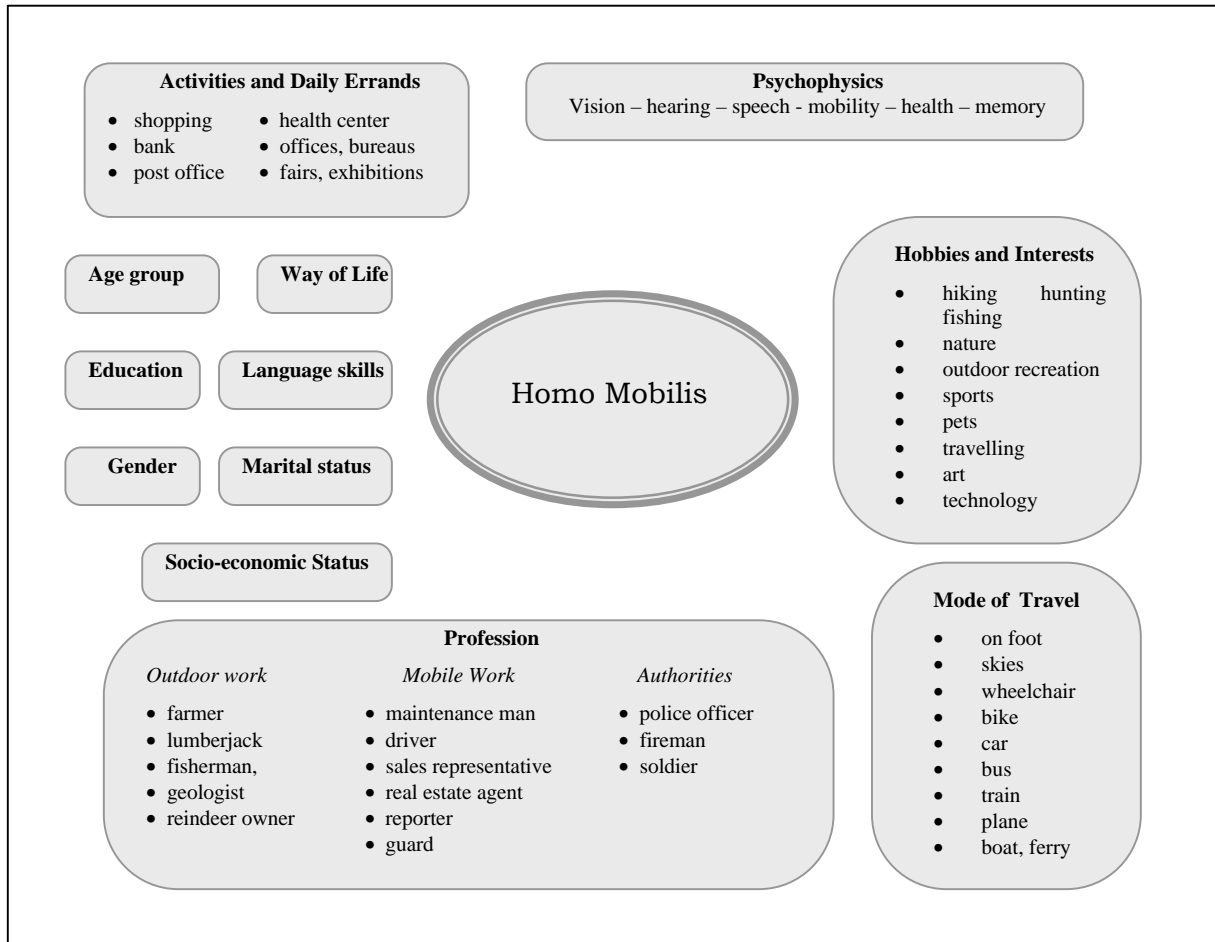


Figure 3. Homo Mobilis model by the NAVI programme. The different aspects of life affecting the need for and use of navigation services.

## 3.2 What can I do with this product/service? (User's task)

It is important to the user to know what he/she can do with the service. User's goal reflects the task the user has at hand: by using the service the user is trying to achieve some goal like locating him/herself, his/her friends or some point of interest. User goal is the most intuitive way to classify services, and it is also most widely used on the market.

Based on our information search we have identified different categories that correspond to different user goals and answer to the question "What can I do with this product?".

### 3.2.1 You can locate yourself

By locating him/herself the user gets information about his/her location in current environment. With this information he/she can do further navigation tasks. The method

for user locating can be either automatic (GPS, cell positioning, etc.) or manual (e.g., the user locates him/herself on the map). There are several ways to illustrate the position to the user (e.g. co-ordinates, map, graphics, text, and speech).

### **3.2.2 Other people can locate you**

The user should be aware if the product that she/he is using makes it possible for other people to locate him/her. In order to use this kind of services; the user should give his/her permission for the other people. The user should be able to see and control options like when other users can locate him/her and who have the permission to locate him/her.

### **3.2.3 You can locate other people**

This is the previous point the other way round. The user should be aware of the mechanism that is needed to discuss the necessary permissions from the people to be located.

The nature of the task of locating other people depends on the interpersonal relations and permissions between the user and the person who is being located. Find-your-friend services help the user to locate other people who have given their permission to be located. Locating people services enable guardians to follow continuously the whereabouts of other people (e.g., underage children and employees).

### **3.2.4 You can track your property**

Tracking services enable the users to track in real time the movement of their mobile belongings (e.g. vehicles and pets). Tracking the property can lead to tracking people when people are moving with those objects that are tracked (e.g. user rents a car and the owner can track his/her car).

### **3.2.5 You can get route guidance from point A to point B**

Route guidance services help users to find their way from some point (user location or some other point) to the point of interest. Services vary in the way in which the route is given to the user (turn-by-turn directions, map, textual information, speech, etc.)

### **3.2.6 You can find and use near-by services**

Location-based services provide users information about their surroundings. This information can be for example news, weather, point-of-interest, traffic and m-commerce.

Location-based information services provide users information about their current location. With the location based point-of-interest service user can find for example the nearest cafe. Traffic services provide users real-time information about current traffic conditions (weather, traffic jam, road conditions, etc.). Location-based marketing services provide enterprises with possibilities to reach potential customers in a given area and at the same time provide consumers with information about services in the vicinity.

### **3.2.7 You can get help in emergency situations**

Safety-related services enhance the user's personal safety by providing the user's location to medical emergency authorities or other help-providing organisations (e.g. car roadside assistance).

### **3.2.8 You can have fun**

There already exist some entertainment-related services, such as games. The entertainment area will probably introduce new kinds of recreation services that are currently hard to predict.

## **3.3 Where can/cannot it be used? ( Environment)**

The environments where PN products are used can vary a lot and this is a great challenge to the designers of PN products. The potential user of the product or service should be aware of the restrictions for the environments of use. Different environments and contexts of use put different requirements for the product. For example the outdoor environment in question whether it is at sea, lake or at land, in the city or in the countryside require in many cases e.g., specialised maps and platforms to use PN effectively. Because PN applications are often used outdoors, also the weather conditions and the time of the year and day must be taken into account. If the service is available only locally (e.g., only in Helsinki) or if the character of the service is different in different areas, this should be outlined explicitly for the user.

Context of use is usually divided to professional/work environment and to the consumer environment. Professional contexts of PN use may vary from fleet management (e.g., forest work – locating fleet, stuff and route guidance) to emergency work (e.g., ambulance work) or nursing (e.g., hospital or treatment of outpatients). Currently consumer contexts and environments of use are in many cases linked to the hobbies that user has and so the potential user of the product can easily imagine and find the context of use for the PN product or service. mobilePosition (mobilePosition, 2002) has classified their services according to the means of hobby or transport: e.g., bikePosition, yachtPosition. These targeted services contain a combination of services that are useful for the users in question. For example, yachtPosition offers location-based information services (closest harbours, weather forecast) and a find-a-friend service (location of boating friends).

Indoor navigation services are still rare, but when they become available it will be important to the user to know whether the service includes indoor or outdoor navigation or perhaps both. Ambient and ubiquitous computing (when becoming more common) will also have effects on the PNS especially in the indoor environments and induction zones (local navigation, hot spots, e-commerce). For example museums, large exhibitions and hospitals have already innovated how they could use and benefit new navigation technology in their area.

From the usability point of view, it is important to consider all the environments in which the product may be used. The different environments should be taken into account already during the development phase, and then later on the evaluation of the products should be carried out in as many real life settings as possible. For example, if a navigation product

or service is designed both for drivers and for pedestrians, different requirements might arise in these different contexts.

At the moment it is a bit unclear whether users will still in the future have different navigation products for different contexts of use. Nowadays e.g., hunters tend to favour a separate personal GPS device even though there are also some other kinds of solutions on the market. It seems that in many cases navigation services will certainly be designed for specific contexts of use and according to the strict requirements for the use in these environments. However, there will also be so called all-purpose context-independent or multicontextual services for occasional or spontaneous use of PNS.

### **3.4 What do I need to know about the technology? (Equipment)**

#### **3.4.1 What kind of technology do I need to be able to use the service?**

The user should be informed about the devices and the additional technical equipment that she/he would need in order to use the product or service. This may include information about:

1. Devices (e.g., Internet applications, cellular phones, PDAs, GPS devices)
2. Networks (e.g. Bluetooth, WLAN, GSM, GPRS )
3. Positioning systems (e.g. Bluetooth, GPS, cellular system)

The service can be embedded into a device as an independent navigation product or it can be available for different client devices. The user should be informed understandably about the technical features of the service or the product so that he/she can compare the advantages/disadvantages of the different offerings on the market.

#### **3.4.2 How compatible this product/service is with other products/services?**

**Can I change the device platform/operator/positioning system ..? What kind of systems do my friends need to have in order to use interpersonal navigation? (Interoperability)** – An important question is going to be to what degree different services and devices are going to work together. Some services might work only for particular operators or mobile devices and some services could be available only in certain areas due to the application and the network. User should be aware of all the limitations (as well possibilities) of usage. For example, what kind of services, devices, and positioning systems do your friends need to have in order to use the same "Find-your-friend" service. Or what kind of positioning devices in moving objects can be located by your tracking system. The interoperability of navigation products and services is composed of different areas:

1. Interoperability of services (e.g., does the service work only for some operators?)
2. Interoperability of platforms (e.g., what kind of devices can be used together?)
3. Interoperability of positioning systems (e.g., can system utilise different positioning systems)
4. Interoperability abroad (roaming, e.g., does my service or device work also abroad?)

### 3.4.3 How accurate is the positioning?

Accuracy of the position defines the kinds of positioning tasks for which the device or the service can be used. The user should be aware of the estimated accuracy of the service and the possible disturbances that might decline the accuracy. Obviously some technologies are more suitable e.g., for indoor or local navigation services than others are. The consumer should know the basic differences of the different kinds of positioning systems to be able to evaluate the service.

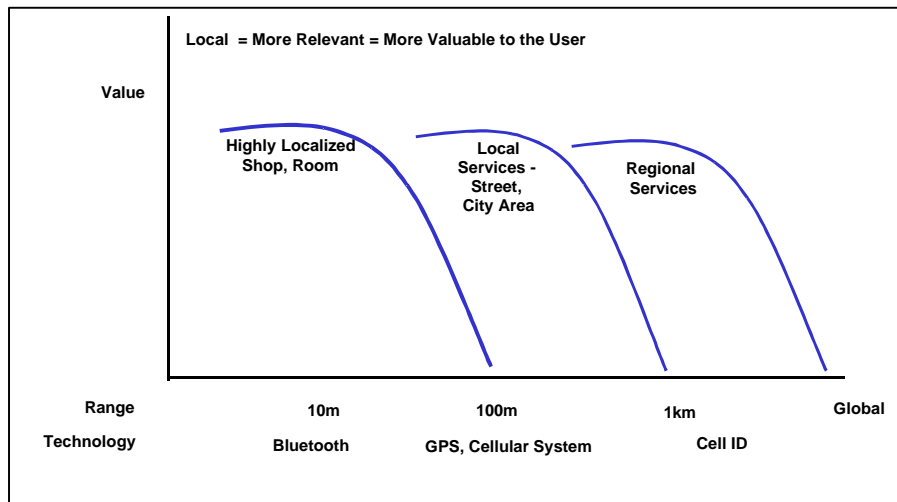


Figure 4. Value of Localized Services (Gibson 2001)

### 3.4.4 To what extent can I rely on this product?

Reliability of the service defines the kinds of contexts in which the system can be used. Reliability and the factors that affect to it must be described to the user in such a way that he/she can realistically estimate the useful contexts to use the service. Reliability of devices and platforms directed to professional use (e.g. 911/112 services) has to be high-classed. In customer services, however limited reliability can be tolerated if the new PN service is just an extra aid for navigation and its limitations are expressed publicly. For example, usually city navigation does not require as reliable a system as hiking on the mountains. Reliability can be expressed in terms such as the validity of the data, the probability of missing signal, battery life and the probability of a break down.

Method	Time To First Fix	Accuracy	Coverage	Impact: Infrast'ure; Handset
Cell ID	1 second	Varies with cell Size	Network wide	Low; None.
E-CGI	1-5 seconds	500m-1km	Network wide	Medium; Low
E-OTD	1-5 seconds	Medium, ~100m	Urban & In-building, Good; Rural, Poor	High; Medium.
Standalone GPS	40-60 seconds	High, ~30m	Urban & In-building, Poor; Rural, Good	Low; High.
Basic Assistance A-GPS	8-15 seconds	High, ~10m	Urban & In-building, Fair; Rural, Good	Medium; High.
Full Assistance A-GPS	1-8 seconds	High, ~10m	Urban & In-building, Good; Rural, Good	High; High.

Figure 5. Location technologies (Ludden 2001)

In general, the underlying technological platform will define compatibility, accuracy and reliability to a large degree. Figure 5 illustrates an example of a description of location technologies. These kinds of descriptions can be included in the trade description. Special attention should be paid to make the description understandable to the users.

### 3.5 What specific features does this product/service include? (Characteristics of the service)

Location-based services can have many different kind of features. The user needs information about these to be able to compare otherwise similar products.

#### 3.5.1 You can see your/your friends track (One-time location vs. continuous tracking)

The positioning of people or moving objects can be one-off or continuous tracking. Usually the person to be positioned gives permission for the positioning separately each time, but in some cases there could be a permanent permission for the positioning, e.g. based on employment contract or statutory guardianship.

The frequency of locating can vary, e.g., once a minute or every tenth second, and this affects the accuracy of the track. Also the speed of the object to be located has an effect on accuracy.

The track can be expressed in different ways to the user. There could be alternative ways to choose from (text, graphics, map, co-ordinate, speech, etc.)?

### **3.5.2 You can have all these location-based services (Available services)**

When the user gets location-based information on available services he/she needs to know the total selection of the available services to assess the validity of the information. The user needs to know how the result is constructed, how the information is selected and how extensive this information is. In addition to the extent of the information it is also important to know how up to date the information is. Also the provider of the information should be presented; is it a public organisation or a certain commercial enterprise.

### **3.5.3 You can plan and store your trip (Support for planning and history)**

One feature of the service is how it can/needs to be used before trip, during the trip and after the trip. The user may want to plan the trip beforehand or the service may require this. After the trip, the user may want to store information related to the trip for later use or to tell about the trip to his/her friends and show them some details (e.g., route, and map). When planning a trip with the service the user should be informed what kind of preparation he/she can/shall do and is it possible to change the plans during the trip (e.g., with Benefon Esc! the user shall load maps from an Internet-connected PC beforehand).

### **3.5.4 The system provides necessary information to you automatically (Push or pull service)**

Information services can be push or pull type. Pull type information is information that the users gets when requesting for it. Push type information is offered to the user without user request. The push may be activated by the current location of the user and/or user profile known by the service.

Some authorities (e.g., police, rescue services) could use push type information so that every user in a certain area is sent the necessary information regardless of their preferences. This kind of services could be utilised in emergency situations.

### **3.5.5 You can get a personally constructed service (User profile and personalization)**

One property of the service is the capability to maintain user profiles and adapt the service according to them. User profile and personalization can be done manually by the user or automatically based on user behaviour or based on the behaviour of similar users.

The user needs to know the rules for personalization if it is made automatically as well as where the user model is stored and how it is being used (e.g., who can use these information and can they give this information to others).

### **3.5.6 The service adapts to different usage environments (Context awareness)**

One way to provide information to the user is context awareness, which is also related to the user profile and personalization. Context-aware services adapt according to the user and the current usage situation. For example context-aware services could adapt themselves according to the time of use, weather, location etc.

### 3.5.7 You privacy is protected (Privacy)

Privacy is a major concern with regard to location information and user personal data (any data that describes a person, his/her characteristics, his/her behaviour or personal circumstances that can be associated to identified person). Privacy related questions are

- Where is the user information stored
- Who is allowed to use the information
- How can the user check the information, that is collected from him/her

The legislative process concerning navigation services is still underway and in the NAVI-program the Regulatory Framework –support project is concentrating on these issues. The ethical work in KEN project is also studying these issues.

### 3.5.8 What does it cost?

The costs resulting from the use of personal navigation services are also affected by technology and factors related to it. The total price to the end user consists of two different parts: the price of the terminal device and the price of using the navigation service. The devices utilising GPS technology are likely to be more expensive at least in the short run as compared to devices without GPS capacity. The price of the service is less dependent on the technical factors and is mostly set by the added value it can provide to the user. However, in some situations the user may be willing to pay more for increased accuracy if it enables desired services.

There could be several different kinds of criteria for charging e.g. one-time payment of the use, the duration of connection, the actual amount of data transmitted or a fixed monthly rate.

### 3.5.9 Who offers the service?

There might be several different producers of the similar services and in some extent the user might want to know the service provider.

Also the users should know who is responsible for the service in the cases it does not work.

### 3.5.10 Choices are based on your values (e.g., sustainable development)

The supply of services should also provide the consumer a possibility to make choices based on his or her values. A good example is the availability of services that support **environmentally sound decisions**. The user could, for example, request a route suggestion that is based on smallest possible environmental impact.

### 3.6 The suggested trade description model

Based on the previous chapters, the suggested trade description model includes the following questions:

1. Is this service suitable for me?
  - Targeted specially for a certain user group
  - Targeted only for a certain group
  - Accessibility for disabled users
2. What can I do with this product/service?
  - You can locate yourself
  - Other people can locate you
  - You can locate other people
  - You can track your property
  - You can get route guidance from point A to point B
  - You can find and use near-by services
  - You can get help in emergency situations
  - You can have fun
3. Where can/cannot it be used ?
4. What do I need to know about the technology?
  - What kind of technology do I need to be able to use the service?
  - How compatible this product/service is with other products/services?
  - How accurate is the positioning?
  - To what extent can I rely on this product?
5. What specific features does this product/service include?
  - You can see your/your friends track
  - You can have all these location-based services
  - You can plan and store your trip
  - The system provides necessary information to you automatically
  - You can get a personally constructed service
  - The service adapts to different usage environments
  - You privacy is protected
  - What does it cost?
  - Choices are based on your values (e.g., sustainable development)

This trade description model can be used as a checklist when describing products or services in product brochures or in Getting Started manuals.

## 4 Developers perspective

In order to get feedback on our trade description model, we conducted a brief evaluation of the model with designers of the technology. In connection to a NAVI-KEN seminar held at Benefon, we asked some employees of the company to fill in a questionnaire as an advance task before the seminar. Our aim was not to have a thorough evaluation of the trade description model but, rather, get some feedback to sketch the difference between the perspectives of the developers and users for a similar product. We collected answers from six professionals dealing with navigation products. Four of these answers were concentrating on a consumer product, Benefon Esc! (Benefon, 2002).

The questions and answers are combined together as follows:

*1. To whom, in Your opinion, the product was targeted in the design?*

- early adapters who love challenges and experimenting
- active, outdoor people on the move
- high-adrenaline people looking for extreme experiences
- globetrotters
- people looking for a professional instrument

*2. To whom is the product suitable?*

- It is suitable for everyone looking for a professional and robust instrument with unique features and a high class design

**It seems that the design for a targeted group has defined user requirements for the device rather strictly. Representatives of the company saw the targeted group fairly abstractly, describing the users in general terms. The suitability of the device was also seen as very limited, only for the group it was designed for. That is why in effect the respondents seemed to consider the first two questions as the same.**

*3. What can the user do with the product:*

- use it as a normal GSM phone
- use 'office services': clock, calendar, calculator, notepad
- use GPS services: track, locate people, navigate to chosen targets and be guided on the way, monitor one's speed, ETE, ETA
- participate location sensitive mobile tribes (like Birdwatchers)
- Navigate using maps (or without a map) and other features, share position information (points of interest) with other people, use position-based services, use it as a dual-band GSM phone

**Developers had naturally a clear picture of the possibilities regarding how to use the product. Problems could arise when articulating these possible use instances understandably to the potential users.**

*4. Where can/cannot it be used?*

- Indoors positioning is not available.
- It is very resilient to water and shock, so it can be used almost anywhere. However, GPS positioning does not work indoors.
- GPS works everywhere but indoors, so it can be used globally for navigation. If user wants to use GSM enabled features, he needs to have GSM coverage.

**Indoor positioning was identified as a limiting factor for using GPS. However, other limiting factors in using GPS were not identified so clearly ( e.g. dense woods, urban canyon phenomena)**

*5. What does the user need to know about the technology:*

- What is GPS, GSM, NMEA
- no prior knowledge is required. However, basic understanding of GPS (given in the user's manual) helps as does openness to learning how to use the instrument.

**The opinions on what the user would need to know about the technology behind the product or service varied. Some respondents thought that the users should know the technology behind the acronyms whilst others thought that the users should be able to use the product without prior knowledge. However, it is not quite clear in what way the technology behind the acronyms should be explained to the users.**

*6. What specific features does the device include:*

- Friend Find, tracking, office applications
- navigation guidance, GPS navigation using map
- downloadable maps from the Internet
- sending and receiving of waypoints and routes
- emergency calls with an emergency key
- access to location-based services
- GSM 900/1800 phone; GSM data / fax modem
- personal information management utilities (calendar, notepad, etc. )
- tough and splash-proof design
- easy to use helpdesk service.

**The area of specific features was largely covered in the answers. No feature was clearly identified above others.**

**The designers of the product had a clear picture of the targeted user group. When the targeted group is pretty much early adapters to new technology and high-adrenaline people looking for extreme experiences, it determines at the same time how the product is introduced to the audience (e.g. how technology is described). It also excludes implicitly some users from the potential user groups.**

## **5 User evaluation**

The trade description model was tested with four novice users (2 men, 2 women) who had no previous experience with the device (table 1). The device used in the tests was Benefon Esc! We also gave the users advertising material to see how they reacted to the ideas of presumed use and user groups of the device. One of the users (female 23) was given the device for one week to use freely.

Evaluation user	1	2	3	4
Gender	female	Male	Male	female
Age	57	37	60	23
Profession	lecturer	Sales director	Pensioner	student
Years of GSM use	12	13	13	5
Hobbies	Reading, theatre	Golf, basket ball, downhill skiing	-	krav maga
GSM experience (+++)	+	++	+	++
Need for navigation	Unfamiliar city	Work and vacation : finding addresses and routes	Driving in unfamiliar area	In work, planning routes
GPS experience (+++)	-	-	-	-
Map experience	Paper maps	Paper maps, web maps	Paper maps	Paper maps, web maps

Table 1 The test users

**First impressions:** pretty handy, some things are hard to understand (F 57); interesting, positive surprise, multifunctional, display is poor, map manipulation and maps are poor (M 37); a lot of information, answers a particular need (M 60); multifunctional, very useful if one can use it (F 23).

**Suitable for you?:** too much operations (F 57); too multifunctional, needless functions (M 37); no (M 60); could be, for route planning and distance measuring – after one week usage did not see as a necessary tool for her (F 23)

**Suitable for whom?:** young, mobile, outdoor men, work, men's gizmo (F 57); outdoor movers, work, techno freaks (M 37) explorers, urban orienteering in big cities, sailors, rescue squads (M 60); older people with memory disorders, professionals (F 23)

**The respondents could not see themselves as potential users of the product. The functionality of the product was a little bit too complicated for them. The designer's idea of the presumed user group coincided well with the answers of the users.**

**What can the user do with the product?:** All users mentioned in their answers the positioning, features related to GSM use and e.g. calendar.

**What does the user need to know about the technology?:** operating principle of GPS, operating time, operations, reliability, map selection (how extensive, what quality) limiting factors in general (all) – however, as little information as possible to cope with the new product (M 60) The operation of GPS was unclear and some users did not know that you could not get positioning indoors, GSM limitations (caves, underground use) was clear to all evaluators.

**Unfamiliarity with GPS is one of the aspects that can mislead potential users to presume functionality of the product wrongly. All the users knew quite well the limiting factors of GSM use although they probably did not know so much about the technology behind GSM. They were experienced users of mobile phones themselves and probably also shared many experiences from their peer groups with GSM use (and misuse – accidents) in different kinds of environments. As users had had no prior experience of GPS or mobile map use, their ideas of the product were not**

based on real world experiences. The potential users had pretty clear and focused questions regarding the technology in their minds (e.g. limiting factors, loading maps, reliability). They also brought up more questions than developers thought the target user group would need.

*What specific features does the device include?:* maps in mobile device, robustness (F 57); long operating time, robustness, water resistance (M 60); yellow pages (F 23).

The users brought up clear features. Robustness was seen as an important feature probably because the product was seen as a tool for extreme outdoor conditions, not as a normal mobile phone with extra features (GPS).

*Most important features of the product – how would you use the product?:* GSM (as a regular mobile phone, text messages), GPS (positioning, adding personal safety in outdoor hobbies, emergency button, estimated time of arrival), maps (route guidance).

Clearly, the integration of GPS and GSM was seen as an added value for the product. The utility of the product was seen pretty much in situations of work or leisure (route guidance) or in personal safety (emergency button). The positioning of other individuals was hardly mentioned by the users. After the pilot period, the user (F 23), who used the device for a week, brought up some questions related to the positioning of others: " if I could locate my buddies, without that they are knowing it themselves...".

*Price?:* The discussion of price brought up different opinions. Some of the users (F57, M60) thought an affordable price better, because a) it should be inexpensive, if it saves lives and b) its added value is so small for the user. However, the other users thought the product as a special device with extra features, so the price could be above the price of a basic device (e.g. mobile phone or GPS device).

Technologically-oriented early adopters do not need to know much about the real word use of novel information technology products. They are eager to become acquainted with the new product by themselves. They will effortlessly come up with usages for the product, possibly usages that are not described in any promotional material or the user's manual. They may even be ready and willing to take risks when adopting a new product.

If the user segments are planned to be more versatile than just early adopters, the users will need more guidance to be able to assess whether the product will be of any use to them. Based on our user evaluation of the trade description model, it seems that the questions that users will ask are in general pretty similar. However, the answers to these questions should be modified according to the targeted user groups and presumed usages of the product.

Describing a product with questions and answers will give quite a fragmented impression of the product. That is why our suggestion for the introduction of a new product to potential buyers is to tell a story, or stories, in which the answers to the questions are given. The story will combine the questions and the answers (traditionally presented in the user's manual) in a more understandable manner reflecting the user's actual need for the product. This kind of approach does not eliminate the possibilities for innovation of different usages than those presented in

**the story, but it would facilitate the understanding of the new product when using it for the first time. One successful example of a usage story is Pointer Solution's Pointer dog radar user story and the overall customer package built around it (Pointer Solutions, 2002).**

## 6 Conclusions

From the user's point of view, a classification of the products and services for personal navigation can be used as a basis for trade descriptions of the products. On the one hand, the trade description helps the customers compare different products and, on the other, the service providers describe their products in a consistent way. Furthermore, the classification helps in defining common terms for new concepts.

In chapter 2 of this report we presented a general classification that can be used to describe the products and services for personal navigation. This classification is based on basic product features from the user's point of view. Since many products include more than one of these basic features, it is not practical to use this basic classification in the trade description. However, the classification could be used in targeting our usability guidelines for different purposes.

In chapter 3 we presented a trade description model based on the defined dimensions of the classification. The trade description model introduces the personal navigation service or product to the user. The classification is structured as a list of questions that the user needs answers to when buying or taking into use a product or service for personal navigation. The provider of the service or product can use the list of questions as a basis when writing product descriptions or when writing 'Getting Started' manuals.

We have also briefly evaluated the model both with designers and end users of the technology. These results were presented in chapters 4 and 5. The trade description model seems to work as such but it is essential that the answers to the proposed questions are targeted according to the end user group. Furthermore, the answers as such give quite a fragmented impression of the product. Most answers could be integrated inside a story that describes the product in real use and in situations familiar to the target end user group. In this way, the description is easier to piece together and the user can assess if (s)he could utilise the product in his/her everyday life.

## 7 References

Benefon (2002) Benefon Esc! <http://www.benefon.com/products/index.htm>  
Online, cited 30.9.2002.

ISO 9241:1998. (1998) Ergonomic requirements for office work with visual display terminals. International Standard. The International Organization for Standardization.

Kimball, J. (2000). Writings. Exercises in Science [www.fauxpress.com/kimball/w/2.html](http://www.fauxpress.com/kimball/w/2.html)  
Online, cited 30.9.2002.

mobilePosition. (2002). [www.mobileposition.com](http://www.mobileposition.com)  
Online, cited 15.10.2002

Pointer Solutions Ltd. (2002). Pointer koiratutka (The dog radar)  
[http://www.pointersolutions.com/fi/metsastys\\_koira\\_gps.htm](http://www.pointersolutions.com/fi/metsastys_koira_gps.htm)  
Online, cited 30.9.2002. In Finnish.

Rainio, A. (ed.) (2000). Personal Navigation NAVI Programme 2000 – 2002. VTT  
Information Technology.

Tekniikan Sanastokeskus (2002). Paikannussanasto (Vocabulary of Positioning). TSK 30.  
Available at [www.navi-ohjelma.fi](http://www.navi-ohjelma.fi)