



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



Deliverable 6

Products and Services for Personal Navigation – Internationalisation and Localisation

Version 2.1

Ari Ahonen, Veikko Ikonen, Eija Kaasinen
VTT Information Technology

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Contact information

Eija Kaasinen
VTT Information Technology
P.O. Box 1206, FIN-33101 Tampere, Finland
Street Address: Sinitaival 6, Tampere
Tel. +358 3 3163 323, fax +358 3 317 4102
Email: Eija.Kaasinen@vtt.fi
Web: <http://www.vtt.fi/tte>

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Tiivistelmä

Tämä KEN-projektin raportti, *D6 Kansainvälistäminen ja lokalisointi*, tunnistaa henkilökohtaisen navigoinnin kannalta olennaiset tekijät, jotka täytyy ottaa huomioon tuotteiden lokalisoinnissa.

Tuotettaessa erilaisia tuoteversioita eri markkina-alueiden tarpeisiin markkinoiden väliset erot on otettava huomioon koko tuotekehitysprosessin ajan. Ne tuotteen piirteet ja ominaisuudet, jotka on tarpeellista mukauttaa markkinakohtaisesti, on pystyttävä tunnistamaan jo tuotekonseptin suunnitteluvaiheessa.

Mukautettujen tuoteversioiden tuottaminen eri markkinoille voidaan tehokkaimmin toteuttaa luomalla ensin pelkistetty ydintuote, joka ei sisällä ainuttakaan kulttuurisidonnaista (tietystä markkina-alueesta riippuvaa) piirrettä (*kansainvälistäminen*), ja tämän jälkeen mukauttamalla syntynyttä ydintuotetta vastaamaan tietyn markkinan vaatimuksia lisäämällä siihen kulttuurisidonnaiset ominaisuudet (*lokalisointi*).

Olemassa olevat tuotteiden kansainvälistämiseen ja lokalisointiin tarkoitetut ohjeet tarjoavat hyvän lähtökohdan myös henkilökohtaisen navigoinnin tuotteiden suunnittelutyöhön. Navigointituotteet sisältävät kuitenkin käyttöliittymäelementtejä (kartat, paikkatieto) sekä toiminnallisia ominaisuuksia (käyttäjän paikannus), jotka ovat erityisiä juuri navigointituotteille. Henkilökohtaiseen navigointiin liittyvät tuotteen ominaisuudet, jotka pitää ottaa huomioon tuotteen suunnittelussa, voidaan jakaa kolmeen ryhmään:

Pintatason piirteet: Navigointiin liittyvät symbolit, värien käyttö, paikkojen ja teiden nimet, osoitetiedot, paikkatiedon laskeminen ja esittäminen sekä kiistanalaisen maantieteellisen tiedon esittäminen (esim. valtakunnanrajat).

Käyttäjän tarpeisiin vaikuttavat kulttuuriset tekijät: Kognitiiviset erot navigoinnissa kulttuurien välillä, kielen vaikutus, navigointiin liittyvät tavat sekä liikennesäännöt.

Lainsäädännölliset sekä tekniset tekijät: Lainsäädäntö koskien mm. yksityisyyden suojaa sekä immateriaalioikeuksia, tarjolla oleva kolmansien osapuolien toimittama sisältö sekä tekninen infrastruktuuri.

Navigointituotteet on tarkoitettu liikkuvalla käyttäjälle. Siksi ei välttämättä riitä, että vain käyttäjän omaan kulttuuriin liittyvät lokalisointivaatimukset otetaan huomioon tuotteen suunnittelussa: ollessaan ulkomailla käyttäjällä saattaa olla tarve käyttää laitetta tai palvelua hankkiakseen kyseistä aluetta koskevaa tietoa. Samoin tietyllä alueella tarjotun navigointipalvelun (esim. kaupunkiopas) käyttäjänä voi olla erilaisista kulttuurisista taustoista tulevia ihmisiä. Tunnistettaessa lokalisointia edellyttäviä tuotteen ominaisuuksia onkin mietittävä kolmea kysymystä: 1) mikä on potentiaalisen käyttäjän kulttuurinen tausta, 2) missä ympäristöissä käyttäjä tulee käyttämään tuotetta tai palvelua sekä 3) mitä informaatiota käyttäjät haluavat saada tuotteen tai palvelun avulla.

Kansainvälinen käytettävyyssarviointi ja käyttäjätutkimukset ovat tärkeitä työkaluja suunniteltaessa tuotteita globaaleille markkinoille. Käyttäjätutkimukset ovat välttämättömiä, jotta tuotesuunnittelussa ymmärretään vieraiden markkinoiden vaatimukset ja pystytään välttämään kulttuurisia väärinkäsityksiä. Käyttäjätutkimukset pitääkin mieluiten suorittaa jo tuotekehityksen ensimmäisessä vaiheessa.

Abstract

This report of the KEN project, *D6 Internationalisation and Localisation*, identifies personal navigation related issues that need to be considered in product localisation.

In order to produce multiple product versions for different market areas, the differences between the market areas need to be considered throughout the product development process. The product features and functionalities that need to be customised differently for different markets must be identified as early as in the concept design stage.

The deployment of customised product versions on different markets can be achieved most effectively by first creating a bare core product that does not include any culture (i.e., market area) dependent aspects (*internationalisation*), and then modifying the core product to meet the requirements of a given market area (*localisation*).

With regard to personal navigation products, the existing internationalisation & localisation guidelines provide a good starting point. However, navigation products contain some user interface elements (maps, location information) as well as functionalities (user positioning) that are not usually encountered in other products. These navigation related issues that need to be considered in terms of product localisation can be grouped into three categories:

Surface level features: Navigation-related symbols, use of colours, place and street names, address information, calculation and presentation of location information, and presentation of navigation-related sensitive issues such as disputed borders.

Cultural level features that affect user needs: Cognitive differences in navigation, impact of language, navigation customs, and traffic rules.

Legal and technical issues: Legislation (privacy, IPR-issues), availability of third party content, and technical infrastructure.

One particular aspect of navigation products is that they are meant for mobile users. It may not be enough if just the localisation requirements of the target market are taken into account: the users may want to use the services abroad in order to access information about foreign areas, and the navigation services (i.e., city guides) offered in a given area may be used by people coming from different cultural backgrounds. Therefore, in terms of identifying localisation requirements one has to consider three questions: 1) what is the cultural background of the potential user, 2) where and in what environments are the users going to use the product or service, and 3) what information will the users want to access with the product or service.

International usability testing and user studies are important aspects in developing products for global markets. International user studies are vital if one wants to understand the way the product should be designed for foreign target markets and how to avoid cultural misunderstandings. The cultural studies of target groups should be conducted as early as possible, optimally in the first stage

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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.

This report is the second version of Deliverable 6 of the KEN project. The purpose of this report is to identify the issues related to internationalisation and localisation that need to be considered in the design process of personal navigation services and devices.

1.2 Scope

The report focuses on internationalisation and localisation issues that are specific to the personal navigation products. The report identifies issues that need to be considered in the design process rather than provide precise guidelines for localisation on personal navigation products.

Due to the focus on personal navigation, general issues in internationalisation and localisation are dealt with only briefly. The report purports to provide references for relevant literature in the field.

The report is based on a general literature review of localisation and internationalisation, analysis of existing navigation products, material and presentations of IWIPS¹ 2001 and IWIPS 2002 and the material already presented in other reports by the KEN project.

¹ International Workshop on Internationalisation of Products and Systems.

1.3 Definitions, Acronyms and Abbreviations

Internationalisation	The process of designing a core product, which is easily adaptable for different cultural areas (locales).
Localisation	The process of modifying products or services to account for differences in distinct markets.
Locale	The features of user's environment that depend on language, country/religion and cultural factors.
Customisation	Designing to meet exact customer requirements.
Personalisation	The process of configuring a product for individual requirements.
GPS	Global Positioning System

1.4 Overview

Chapter 2 *Internationalisation and Localisation* introduces concepts that are used in the report and provides background for internationalisation and localisation. It presents generic localisation issues that are encountered in the design of most software and information technology products. The chapter also includes a section on international usability design.

Chapters 3 *Localisation of navigation products* focuses on specific internationalisation and localisation issues that are related to personal navigation products and services. The chapter first discusses localisation of personal navigation products in general terms and then moves on to identify important issues that need to be considered in the design process, organised in three themes: surface level features, cultural level features, and legal and technical issues.

Appendices in the end of the report provide further information relating to internationalisation and localisation. Appendix 1 provides a list of guidelines for internationalisation and localisation. Appendix 2 contains information on web resources dealing with internationalisation and localisation. In Appendix 3 one can find a list of internet-based map services available in different countries.

2 Internationalisation and localisation

2.1 Designing for international markets

If products are to be launched on different market areas, the designers must take into account the possibility that some user requirements or technological requirements can be different in different areas. Therefore it may be necessary to release multiple versions of the product to different market areas. The design approach that takes into account these differences in the market areas comprises two processes: internationalisation and localisation.

Internationalisation refers to the process of designing the core product and its base structures in a way that allows for later (cultural) customisation. This requires that all the elements of the product that are culture-dependent are separated from the product core. This makes it possible to customise these culture-dependent elements easily and cost effectively according to the preferences of different market areas, without having to alter the core product. For example, a common practice is to put the user interface elements of a software product into resource files. This makes it easier to translate the text strings, shortcut keys and other elements without touching the original code.

Localisation is the subsequent step in the product development. LISA (Localization Industry Standards Association, www.lisa.org) defines it as "the process of modifying products or services to account for differences in distinct markets". In practice this means that localised versions of the product comply with local conventions, cultural preferences and market requirements. In the past, localisation has consisted mostly in translating the user interface and documentation, and ensuring that local conventions concerning date and time format can be used. However, recently the shift has been towards localising, in addition to the concrete elements, also the more abstract and cognitive aspects of the product such as information architecture, visual direction and so forth (del Galdo, 2001).

The rationale behind internationalisation and localisation is that addressing the international customer requirements early on in the product development cycle is easier than trying to retrofit changes into complete products. The development costs may increase up-front but the total costs are reduced due to easier implementation of localised features in the later stages of product development.

An important question in product development that should be addressed in a very early phase is to analyse which product features should be localised and which features are global, i.e. the same for all locales (del Galdo, 2001). Localising all the aspects of the user interface is not necessarily feasible. The elements that are kept constant in the product should be designed neutrally so that they are acceptable for users from different cultural backgrounds (Marcus, 1999). Therefore, the total product "consists of partially universal and partially local solutions to the design of metaphors, mental models, navigation, appearance, and interaction" (Marcus, 1999).

2.2 Arguments for product localisation

The arguments that have been presented to justify product localisation can be divided into two categories: hard business reasons and soft ethical reasons (Day, 2002). The business reason claim that localisation increases sales and customer satisfaction and therefore affects the return on investment. The soft reasons argue that localisation is simply "the right thing to do": localising the products helps preserving cultural diversity. Table 1 presents a summary of the main benefits that can be derived from internationalisation & localisation approach.

Hard reasons	Increased market area. The product can be sold worldwide in market areas that otherwise would not accept the product.
	Increased customer satisfaction.
	Reduced time to market.
	Simultaneous shipment of localised product versions to markets becomes feasible.
	Localisation is product differentiation and enables product promotion.
	Maintenance and version control of the product is easier and less expensive.
	Localisation also enables companies to build credibility in export markets; it conveys the company's sense of respect for the culture's history, customs and language.
Soft reasons	Effective mechanism for the transfer of technology.
	Preserving some of the diverse elements of culture.

Table 1. Hard and soft arguments for localisation. (Carey, 1998; Day, 2002; Ishida, 2001; Yeo, 1996; Layden, 1998)

2.3 Generic issues in product localisation

Issues that need to be considered in the localisation context range from regional conventions to underlying cultural user characteristics. The following lists provide an overview of different issues. For a more thorough discussion of general localisation issues and further references, the reader is advised to see Gribbons (1997), Carey (1998) and Rejmer et al. (2001). Appendix 1 contains a list of guidelines for product internationalisation.

In order to support input and output with the user's native language, the following issues need to be considered in the design process:

- **Alphabets and character encoding.** Different encoding systems may be needed to display the characters of different languages.
- **Reading and writing direction.** Languages vary in terms of writing direction, for example Arabic and Hebrew are bi-directional languages (mostly read from right to left).
- **Date and time formats, measurement and currency units.** Countries have adopted different conventions regarding the use of punctuation marks and placing of special symbols.
- **Sorting.** The sorting order depends on the language and the alphabet that is used.

Translation of the user interface and design of culturally acceptable and appealing user interface also requires the designers to pay attention to

- **Translation.** Languages require different amount of space to express ideas.
- **Design of symbols and icons.** Icons and symbols that are used should be both recognisable and acceptable to the local users.
- **Use of colours.** Colours have different associations in different cultures (Vanka, 1999). Not only have some colours themselves associated meanings, but also many colour combinations have values attached to them (Chen, 1999).
- **Visual flow direction.** Writing direction also affects the direction from which the users start to process information contents displayed on the screen.
- **Aesthetic appeal – "look and feel" of the product.** Aesthetic preferences differ between cultures, both because of local artistic and stylistic traditions and fast-changing local trends.

In addition to addressing the issues mentioned above, it is worth the effort to consider whether there are differences in the mental models that the users in different areas have for carrying out tasks with the product in question; in other words, should some functionality be changed in order to accommodate the way in which the users want to get things done and find a better match to the expectations of the local users about organisation of information or functionality in the product.

There have been attempts to describe cultural differences in terms of a few variables, which then could be used to provide guidance for product development. The most prominent theory has been that of Geert Hofstede. Hofstede argues that culture differences can be described largely by variation on five major factors (Hofstede, 1997):

1. **Power distance**, i.e. a measure of the inequality between managers and non-managers, and the extent to which this is accepted.
2. **Uncertainty Avoidance**, i.e. the degree to which one is comfortable with ambiguous situations and can tolerate uncertainty.
3. **Individualism vs. Collectivism**, i.e. the degree to which one thinks in terms of 'I' versus 'we', whether ties between individuals are loose or whether people are part of a cohesive group throughout their lives.
4. **Masculinity vs. Femininity**. Also known as achievement versus relationship-orientation cultures. Cultures high on masculinity rate achievement and success more highly than caring for others or quality of life.
5. **Long or short-term orientation of different cultures**. The time frame used, i.e. short-term (involving more inclination toward consumption, saving face by keeping up) v. long-term (involving preserving status-based relationships, thrift, deferred gratifications)

This approach has also been used widely to adapt different concepts for different cultures in the field of localising products and services (e.g., see Marcus, 2000, for discussion of suggested implications of Hofstede's theory for web design). However, Hofstede's theory gives generalisations about cultures to a degree that may not allow for the rich variety of values, attitudes, expectations and behaviours found among the members of any given country and in the far more rapidly changing subcultures. In this respect it would be important to undertake a qualitative study of narrowly-focused target markets at a given time to find meaningful factors in different cultural segments (e.g., Hall, 2001). Relating to problems of identifying the real cultural factors, Mrazek and Baldacchini (1997) have used the term "cultural false positives" to describe study results that mistakenly ascribe differences in users' goals and tasks to culture – differences that are actually variations in user type and segmentation.

Additionally, very few studies, if any, have provided empirical evidence about the applicability of Hofstede's theoretical model to product localisation. Therefore, it may be better to consider Hofstede's model (and other theorists' models) as a framework that helps to recognise important dimensions that need to be considered, rather than an absolute description of cultural differences.

2.4 International usability design

One aspect of international product development is international usability evaluation. Even though some results and guidelines concerning international usability studies of different products in different cultural areas are available, it is necessary to conduct international usability testing when presenting a new product for foreign markets or make some major changes to the product already sold abroad. As with all user testing, the two fundamental elements of international user testing are to involve real users and have them do real tasks without your help (Nielsen, 1996).

International user studies are vital if one wants to understand the way the product should be designed for foreign target markets and how to avoid cultural misunderstandings. The cultural studies of target groups should be done as early as possible, optimally in the first stage of the development of the products or services. In some cases, however, e.g. due to resources, this is not possible. Even then, belated international usability studies are better than nothing. (Dray, 2001)

Basic aspects that need to be considered while organising the international usability study include: language and cultural knowledge that is needed to carry out the study, location where the test will take place and recruitment of participants, and whether outsourcing or do-it-yourself will be a better solution (in addition to cost factors one has to consider issues such as gaining experience and confidentiality concerns).

Nielsen (1996) finds four main ways of conducting international user testing:

- go to the foreign country yourself
- run the test remotely
- hire a local usability consultant to run the test for you
- have staff from your local branch office run the test, even though they are not trained in usability

A fifth possibility according to Nielsen is opened only to the largest companies: to build additional usability groups in your major markets. This last option is usually beyond the available budget.

In making the international user or usability study, one can separate three different stages: preparation, the test (being abroad running the test), and the aftermath. Preparation is a key factor in doing user and usability studies in general but when conducting these studies in foreign areas it is even more important to prepare in earnest. Besides cultural differences, one should also take note of the technological state and standards (e.g. voltage, type of plugs) of the district and facilities, and the choosing and training of facilitators and translators. (Dray, 2001)

The in-country team should be well organised and ready for pitfalls. Culture shock, jet lag and acute illness are some of the things that are sure to confront one or more of the members of the usability team. Flexibility is one of the most important qualities required of a team and study because once you are in-country and something unexpected happens, it

is important to be able to do some international studies of the subject anyhow. Analysis of the material could be started already in-country and continued later on. (Dray, 2001)

The last stage of the international user studies is gone through after actual studies in-country. Dray lists the following as needing to be done afterwards: paying the facility promptly, overall debriefing as a team, spreading the information, learning for the next time and evaluating your evaluation. (Dray, 2001)

Guidelines and summaries of international usability testing are provided for example by Modica and Fiedler (1999), and Nielsen (1996). A case study can be found in Dray and Mrazek (1996). Table 2 provides information that is available on the web for international usability testing and table 3 lists companies that offer international usability study services.

Systemconcepts	www.system-concepts.com/articles/global.html
Useit.com (Jacob Nielsen)	www.useit.com/papers/international_usetest.html

Table 2. Websites providing tips for international usability testing.

HCI Bibliography	The Intercultural page contains links to information on intercultural issues in human-computer interaction, including but not limited to: internationalisation, globalisation, localisation, language and translation, and standards. www.hcibib.org/intercultural/
Usability Professionals' Association	www.upassoc.org
ESOMAR	ESOMAR (World Association of Opinion and Marketing Research Professionals). Searchable resource listing over 1500 Research Organisations in 100 countries, as of 02.08.2001. www.esomar.nl
LISA	Localization Industry Standards Association. www.lisa.org
Quirk's Marketing Research Review	Comprehensive directories of custom research providers. www.quirks.com

Table 3. Websites offering information on companies that offer international usability study services.

3 Localisation of navigation products

3.1 Overview

The rationale for internationalising and localising personal navigation products is very much the same as with any other product; a personal navigation product that is launched on culturally different market areas will have users from different locales with different needs and preferences that need to be accounted for. Therefore, the standard internationalisation and localisation guidelines also provide a good starting point in the case of personal navigation products.

Personal navigation products, however, contain user interface elements (maps and navigation-related symbols, information about place names and locations) and other characteristics (e.g., user positioning) that are not so often encountered in other products. Also the differences in users' mental and cultural models for wayfinding and social navigation need to be considered, as well as differences in the appropriate legislation. In this report, these issues related specifically to the localisation of personal navigation products and services have been grouped into three categories: *surface level features*, *cultural level features*, and *legal and technical issues*.²

The section *Surface level features* lists features that need to be considered in the design of user interface of navigation products. Under this category are placed the issues that need to be considered to make possible or ease user interaction with a navigation product. The main concern here is how the user can input information to the system and receive understandable navigation guidance.

The section *Cultural level features* presents underlying cultural factors that need to be considered in the design of personal navigation products. This category groups together underlying cultural characteristics that users from a given cultural area can be expected to have in common but which may differ between cultural areas. Cognitive differences in navigation and cultural schemas concerning social navigation play a prominent role here.

The section *Legal and technical issues* presents legal and technical issues that arise from the infrastructure in which the personal navigation products are used. This category deals with problems posed by regional differences in legislation as well as technical and service infrastructure. These issues pose an additional challenge to the design and deployment of navigation services internationally.

In the case of personal navigation products, the situation is further complicated by the fact that many of these products are by their nature both *personal* and *mobile* – meaning that the user may travel with the product in different countries and use it in different environments. In this case, it is only the context of use that changes, while the user remains the same. The product should be usable in a foreign environment that differs

² The division between the surface level and cultural level categories reflects the view that the features can be seen to represent different levels of complexity (Gribbons, 1997; del Galdo & Nielsen, 1996): in general, surface level deals with more technical matters, like local encoding of characters, whereas cultural level deals with more cognitive (visual direction) or cultural (person's values) aspects of product localisation.

from the user's native environment. Also, if the product depends on local resources, such as a network connection, it must be able to operate with different underlying infrastructures. The mobility of the users also affects network-based navigation services: even if the navigation service is provided in a limited geographical area, the users of the service may come from different countries. For instance, a local city guide in London may be used by visiting Japanese tourists (Figure 1).

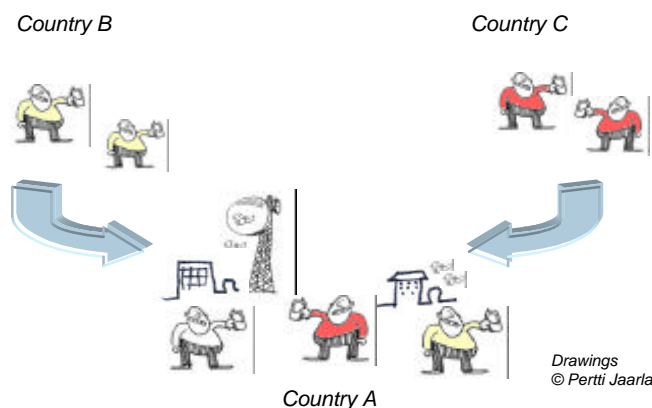


Figure 1. The service offered in county A may have users coming from different cultural areas.

3.2 Surface level features

The surface level issues deal mostly with how the interface and information contents can be designed to support the effective flow of information between the user and the system. The common navigation-related user-interface elements, such as map symbols and signs used for route guidance purposes, should be easily recognisable to the user. At the same time the system should be capable of processing the information and queries, including proper names and addresses, that the user may wish to enter into the system. In effect, these issues correspond to what del Galdo and Nielsen (1996) see as being the first two levels of product localisation: enabling the use of the product in the user's native language, and making the product understandable and usable for the user.

Symbols. There are two related factors that need to be considered when designing the navigation-specific symbols: recognisability and local conventions. Navigation symbols are easier to recognise if they correspond to the user's everyday experience of traffic and guidance signs and map notations (Figure 2). Cultural areas may have different signs that are customarily used in route guidance, and some countries or areas can have specific symbols that are recognised only in a limited cultural area. For example, in Japan there is a specific sign for post office that is not well-known nor used outside Japan.

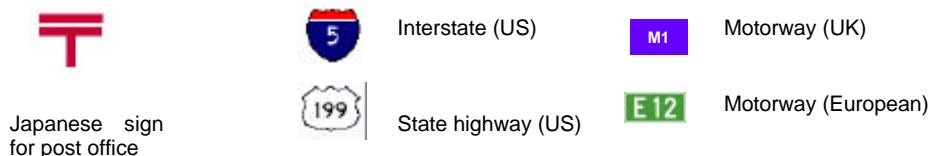


Figure 2. Examples of navigation-related symbols that are used in different areas.

Colours. We can expect that normal localisation guidelines about colours apply also for navigation products, but especially with maps it is necessary to bear in mind that cartography has its own rules for using colour. So far we have not found any indication that there may be critical cultural differences in the use of map colours.

Place and street names. Cities, streets, rivers and all named locations in general can have different names in different languages. This has to be taken into account when the user is asked to indicate a place, for example in search engines. The Swiss city where the UN's European headquarters are located can be spelled Genève, Genf, Geneva or Geneve, depending on the language. In some multilingual areas it is common to have parallel names for cities and streets in different languages. For example, in many areas in Finland the streets have both Finnish and Swedish names that do not necessarily bear any resemblance to each other (e.g., Hämeenkyläntie – Tavastbyvägen). Another issue is that in some languages there is more than one way to transliterate proper names into Latin script. Translation of Hebrew names, for example, can result in slightly different variations, depending on the transliteration that is used (e.g., a transliteration of city name קִרְיַת גַּת can be written either Kiriat-Gat, Qiriat-Gat, or Kiryat-Gat). An ideal navigation product, of course, should be able to recognise all the possible variations.

Address information. The information that is included in the address and the format in which addresses are customarily written can vary between cultural areas. In Japanese cities, addresses do not necessarily include street names at all. In the US, the name of the state is usually included in the address, whereas in many other countries the addresses do not contain a corresponding component. From a navigation point of view, in some areas it may also be necessary or beneficial to include additional information with the address to help the user find the way to the desired location. In major cities like London or Paris, this would most probably be the closest underground or *métro* station.

Differences in calculating and presenting location information. The variation of measurement units is an obvious concern for navigation products. In addition to this, navigation products may need to be designed to calculate location information using different datum and present it using different co-ordinate systems. These requirements are especially salient with GPS devices. Even though widely used global co-ordinate systems (e.g. WGS84) do exist, many countries have their own co-ordinate systems and map grids that the local users have learned to rely on (Figure 3). An example could be the Finnish *Yhtenäiskartastokoordinaatisto* that is defined only in the areas close to Finland.

Latitude and longitude coordinates (global)	N 61° 26' 40,6" S 23 ° 51' 36,6"
Ordnance Survey National Grid (defined in UK)	SP 86323 33753
Yhtenäiskartastokoordinaatisto (defined in Finland)	336020 E 669350N

Figure 3. Examples of different presentation formats for location information. Note: the locations indicated in the above examples are not the same.

Sensitive issues. In some cases navigation-related information may be sensitive in the sense that it can be seen as offensive to some people. For instance, this could be the case when presenting disputed national boundaries or place names on maps.

Need for simplified English version. It may not be possible to offer all the users the navigation service (or the information contents) in their native tongue. In this case, a feasible alternative is to provide a simplified English version of the product that utilises non-complicated English terms and phrases that are easy to understand for the user.

Table 5 summarises the surface level features as a checklist for designers of personal navigation products.

<p>Does the product contain symbols that may need to be modified so that they are easier for local users to recognise?</p> <p>Do the localised versions of the product require (additional) symbols that are specific to a certain area?</p> <p>Have the different variations of place and street names been taken into account where appropriate?</p> <p>Does the variation in address format and content affect the product design?</p> <p>Is it necessary to modify map and navigation symbol colours for the target area?</p> <p>Are there any sensitive issues, such as disputed borders, that need to be treated with caution?</p> <p>Is there a need for a simplified English version of the product?</p>

Table 5. Checklist for surface level features.

3.3 Cultural level features

The cultural level features are concerned with underlying cognitive and linguistic differences, customs relating to navigation, and other local factors that may affect the user requirements for navigation services. These issues affect what kind of functionality should be incorporated into the product, and what is the ideal way of presenting navigation information to the user. In relation to the levels of localisation proposed by del Galdo and Nielsen (1996), these issues deal with the final third level, i.e. producing systems that accommodate the user's cultural characteristics.

Cognitive differences in navigation. There are indications that there is cross-cultural variation in how geographic space is conceptualised for navigation tasks (Mark et al., 1999). Daimon, Nishimura and Kawashima (2000) argue that since cognitive maps are constructed on the basis of urban layouts and regional characteristics, it is necessary to consider these environmental factors when designing route guidance systems. Different environmental characteristics may result in different cognitive maps, which means that the users may benefit from different kinds of navigation information: in some areas, landmark information may be more important, whereas in other areas street names are of more importance. One prominent factor is the difference between grid-pattern cities and cities with irregular layouts: the people living in an area where a grid pattern is commonly used may learn to rely on this pattern in their navigation tasks. The people from areas where the city layouts are prominently irregular may prefer other navigation strategies (Davies & Pederson, 2001).

Impact of language. One way of conveying navigation information is through language. Language offers different ways of expressing spatial information: route directions and spatial information can be presented in different ways and from a certain perspective using different reference systems (Mark et al., 1999; Taylor & Tversky, 1996). Languages differ in terms of what reference systems exist and which ones are preferred in certain situations. These findings may have implications especially for generating route guidance directions.

Navigation customs and social interaction. Technology and culture affect each other, and social and cultural aspects influence greatly whether a technology will turn out to be a success (Brown, 2002). Existing local navigation customs and ways of social interaction affect the usage cultures that will emerge for the navigation products. Therefore, the way in which people use existing navigation aids and products should be studied in the design phase. This knowledge will help shed light on user requirements in a given cultural context.

The importance of navigation customs and other cultural factors can be expected to be greatest in the use of and need for interpersonal or community-based navigation services that can be used to locate other people and establish a sense of community between the users. As Green (2002) has pointed out, the concept of privacy is not the same in different cultures. The people may regard differently the idea of being located and locating others depending on their cultural background (Figure 4). Services that make it possible to track other people (children, the elderly or friends) could be adapted quite differently to meet user needs in different cultures. For example, using the new technology to track aged relatives suffering from memory disorders will presumably have very different applications in Asian, South European and Scandinavian cultures.

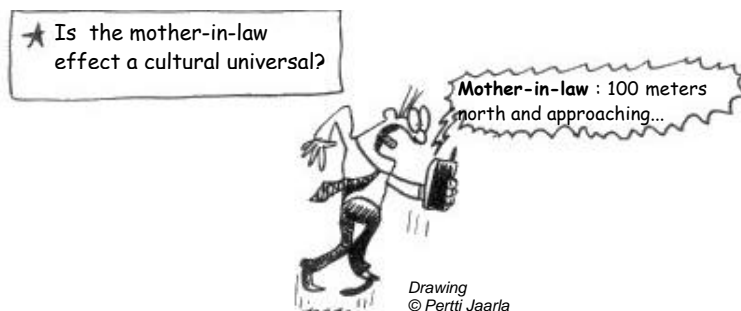


Figure 4. The products may be adapted differently in different cultures.

At the same time it should be remembered that there are subcultures inside cultures. Identifying these subcultures is a task in which user studies conducted by usability specialists come into close contact with the customer segmentation approach used in marketing (Siegel, 2001, discusses similarities and differences between marketing and usability studies).

Local traffic customs and rules. The practice concerning how traffic rules are indicated can differ between countries, and some rules may even be country-specific. One obvious factor that has to be taken into account is the side of the road on which people drive. Moreover, it cannot be automatically assumed that the same traffic rules apply to the whole country: for example in Quebec, Canada, it is not allowed to turn right on a red light, while in the rest of the country it is permitted. In Europe, the right of way is not indicated explicitly with yield signs as often as in the US. This can result in dangerous situations if the driver's expectations of the right of way in a foreign environment do not match the real situation (Summala, 1998). These factors should be considered as they may affect what information is important for the user: what is the information that the local user is expecting to get from the navigation product, and is there some additional information that should be presented to a non-local user.

Table 6 presents a checklist for cultural level features. We acknowledge the fact that finding answers to these questions is not an easy task. Studying these issues may, however, help to understand the actual user requirements for navigation services.

<p>Are there underlying cognitive differences that could affect the choice for the way in which the information is presented?</p> <p>Does the user's language have generally preferred ways to formulate descriptions of routes or locations?</p> <p>How do the local navigation customs and ways of social interaction influence the need for and the functionality of navigation services?</p> <p>Do the different customs and rules of traffic have a bearing on product design?</p> <p>Does the design take into account the needs of the users visiting unfamiliar cultures?</p>
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Table 6. Checklist for cultural level features

3.4 Legal and technical issues

Not just the users' preferences and cognitive models affect the localisation of personal navigation products. Countries may have different legislation regulating how companies may aggregate and distribute user information. In the case of personal navigation, this applies most notably to location information. The underlying service infrastructure and standards can be different as well, thus limiting the availability of required content (e.g., map data) or posing difficulties for services that utilise local networks for data transfer or positioning.

Legislation in the target areas should be studied with care. In personal navigation, the most important legal issues are related to privacy, IPR issues (intellectual property rights), and liability and contractual issues (Simojoki, 2001). Knowledge regarding the location of a person constitutes very sensitive information, and privacy laws define how this information can be collected, stored and distributed. IPR issues are related to the licensing and utilisation of the content used in the provision of the location-based services. Commercial utilisation presupposes reliable and effective contractual practice. Liability issues are important if the product should cause damage in the event of malfunction or misuse. The legislation for the application field, such as direct marketing and employment relations, should also be studied when providing personal navigation services.

In the European Union (EU), the privacy legislation is based on detailed regulations on how to deal with personal data. The EU Data Protection Directive (95/46/EC) and EU Tele Privacy Directive (97/66/EC) provide a general framework of the legislation in EU member states.³ However, the domestic legislation have differences even within the European Union. In Finland for instance, as of autumn 2002 it is forbidden to send push messages, i.e. messages that are sent to the receiver without a request from the receiving party, to a person if (s)he has not given permission to do so. At the same time, in some other EU countries push messages are allowed without the permission of the receiver. In the US, the privacy-related regulations deal more with the consequences than with the handling of the personal data as such. (Simojoki, 2001)

Third party content providers are often essential partners in launching navigation products, as they provide the maps, databases and location-based services that the services utilise. One should study whether this material is available in the target market, how comprehensive the contents are, and how the material can be distributed to the users. It is also important to determine whether the quality of the contents is up to standard and whether the content material is updated often enough.

Technical infrastructure and industry standards can be different in different areas. A navigation product or service usually needs underlying technical infrastructure, e.g. mobile terminals, positioning systems, networks and so on. It is necessary to find out whether the required technology is available in the market area, and how commonly the technology in question is used. The most notable differences in infrastructure are the various telecommunication standards around the globe. Network coverage, for example WLAN (wireless local area network), may be available locally in varying degrees. Markets also differ in terms of the penetration of different mobile devices.

³ The new EU Tele Privacy Directive was approved in July 2002. It will probably bear effect on Finnish legislation in 2004.

Table 7 presents a checklist that summarises the issues relating to legislation and infrastructure.

Does the legislation in the target area pose either requirement or limitation problems to the personal navigation services?

Is it possible to obtain the required content from third party content providers in the target area?

What kind of problems may the local technical infrastructure and standards present for the release of the planned product?

Table 7. Checklist for technical and legal issues.

4 Conclusions

Users will have the greatest need for navigation products and services when they are visiting unfamiliar or foreign areas. In order to ensure that the personal navigation products can also be used in these foreign environments, they need to be designed so that they can adapt to different environments of use and different infrastructures. In this case, it may not be enough if the product is localised to the user's own cultural or country-specific requirements.

Standard internationalisation and localisation guidelines and best practices also apply to the design of personal navigation products. However, these need to be supplemented by consideration of personal navigation specific issues. The localisation requirements that are specific to personal navigation products and services can be divided into three categories: surface level features, cultural level features and legal and technical issues. The main conclusions that stand out are

- Key navigation-specific surface level issues that need to be considered in internationalisation and localisation include the design of understandable symbols and the support for different variations of proper names. In addition, the possible need for a simplified English version of the product should not be overlooked.
- One will most likely encounter cultural differences in the use of personal navigation products and services within different geographical areas and countries. Central cultural factors that need to be considered in the design include cognitive and linguistic factors, usage cultures and local traffic customs.
- Localisation and internationalisation of personal navigation products and services are affected by legal and technological factors. These factors are especially important if the user travels with the product in different cultural areas.

The issues presented in this report form a background for understanding what kind of cultural variables need to be considered in the design of personal navigation products. Most of the issues discussed in this paper should, however, be studied in more detail. This is especially true of the cultural level issues: these are hard to measure, but understanding them may prove valuable in developing successful personal navigation products and services. However, while conducting international usability studies to identify cultural differences, one needs to take care not to interpret differences that result from users' personal preferences or goals as cultural differences.

At this point, it is still relatively difficult to provide priorities to different issues discussed in this paper. It may be that some of the issues prove to be mostly of academic interest with few implications to actual product design, whereas some others simply cannot be disregarded, such as legislation and technical infrastructure. Nevertheless, it is safe to argue that all the issues should be considered during the product design phase.

All cultural level and technical issues and most of the surface level issues need to be considered for the first time as early as in the concept design stage of the product development. This needs to be done in order to identify both the user requirements and the possible limitations caused by technical platforms and data resources (e.g. geocoded databases) that are available. Later on, internationalisation and localisation issues need to be considered again as the product development proceeds. Only some of the surface level features, such as symbols and colours, can be left to the later stages of the design process.

5 References

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Appendix 1 - Guidelines for internationalisation

Some general guidelines can be provided for the internationalisation of software products. The table below contains guidelines compiled from several sources. The sources indicated in the right-hand column can be found below the guidelines.

The central theme that is reflected by the guidelines is to develop the software in a modular, extensible and accessible way so that future localisation can be done more easily (Rejmer, Cooper and Vanderdonckt 2001).

	Source
General	
Internationalisation must be addressed along with the concern of keeping the cross-platform portability.	2
Don't combine data and code. Detach the core binary executable file from the user interface; store all the information on the user interface in resource files.	2
Always check that the third party software you are using and/or adding to your software is localisable or whether the manufacturer has already made localised version of it.	2
Proceed with usability testing in the locale to detect problematic issues.	2
Translation of the UI	
Never put strings of natural language characters in the program code.	1
Never write code that depends on the physical characteristics of a natural language string.	1
Be careful with program features that ask for user input.	1
Allow for expansion of displayable text and boundaries boxes in user interface. Expressing ideas take more space in some languages than others; the characters also require different amounts of space (Latin vs. kanji).	1, 2
<ul style="list-style-type: none"> - Make a dynamic layout of any bounding text boxes. - If you must use static buffers, make them extra large to accommodate localised strings. Leave room for expansion up to twice the length and height. 	
Avoid creating text in graphic format. If you do place text in graphic, ensure that the path to the image is in a resource file so that a new one can be substituted.	2
Do not create a text message dynamically at runtime, either by concatenating multiple strings or by removing characters from static text. Word order varies by language, so dynamic composition of text in this manner requires code changes to localize to some languages.	1
Adjust the layout menus, tables, dialogue boxes, and windows to account for different directions of text.	1, 3
In order to speed-up the translation, provide comments in the resource files.	2
Avoid abbreviations that are potentially difficult to understand.	

Acceptability of symbols, metaphors and expressions

Make sure icons and symbols are universally recognisable. 1, 2

Culture-dependent graphics should be avoided; many symbols and pictures have culture-dependent meanings.

- Be cautious in the use of religious symbols (avoid them if possible).
- Be careful when using animals (they have different meanings in other cultures).
- Be cautious when using human figures. Consider whether it is acceptable to display human figures that are recognisable as belonging to certain race or other category, or should one use general depictions. 1,3
- Check gestures in the target market and avoid negative gestures.
- Be cautious when using pictures of body parts (eyes, mouth) For example, Japanese find disembodied body parts unappealing (Marcus, 1999).

Check gender roles of target culture and make sure your software does not violate them. 1

Avoid ethnic stereotypes. 1

Avoid jargon, slang, and infrequently used words so as to avoid misunderstandings. 1

Be cautious when using humour; avoid jokes which could be seen as offensive by some groups. 1

Use colours and sounds that are culturally appropriate, or offer the user the possibility to customise the colour scheme used to conform to other cultural aesthetics. 1, 2

Units and calculations

Check weights, measures and formats. The software must be able to generate and display numbers and other information using the appropriate local convention. 1, 2

- 12-hour clock and 24-hour clock. Separators can be a period or a colon.
- Daylight saving time conventions vary.
- Dates have many representations and different separators.
- Some countries have locally used calendars (Japan, Islamic and Jewish calendars).
- Measurement units vary between countries: cm vs. inches and so forth.
- Separators in number representations are different: decimal separator, thousands separator.
- Positioning of special symbols may vary from language to language (\$ 500 or 500 €).

Allow for variable papers size. 1

Check financial calculations for conformation to local conventions. 1

Shortcuts and mnemonics

Since keyboard shortcuts and mnemonics are not always equivalent on different platforms and languages, ensure that any new keyboard shortcuts you have created are compatible with existing shortcuts and mnemonics on all your target platforms. 2

If your software is a cross platform and multilingual application, test the compatibility of the shortcuts and mnemonics on different platforms. 2

Make sure that the characters you have chosen for your shortcuts or mnemonics are available on as many different international keyboards as possible. 2

Store keyboard shortcuts and mnemonics in resource files, so they can be changed easily for a particular language if needed. 2

Other

If you have to use graphic format with text, software that allows layering will make future changes in the text easier.

2

Keyboard layouts are different and all keyboards do not contain the same characters.

Sorting order depends on the language and the alphabet that is used.

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2 – Rejmer, P., Cooper, M., Vanderdonckt, J. (2001). Lessons Learned From Internationalizing A Web Site Accessibility Evaluator. Designing for Global Markets 3. Proceedings of 3rd International Workshop on Internationalisation of Products and Systems, 2001, 61-79.

3 – Marcus, A. (1999). Globalization and User-Interface Design for the Web. Designing for Global Markets. Proceedings of 1st International Workshop on Internationalization of Products and Systems, 1999, 165-172.

Appendix 2 – Resources on the Web

The table below provides information about web sites that offer information concerning internationalisation and localisation of products and services.

LISA	Localisation Industry Standards Association (a non-profit organisation) www.lisa.org
Microsoft	Microsoft Global Software Development site offers localisation related information. www.microsoft.com/globaldev/
Unicode	The Unicode Consortium is a non-profit organization founded to develop, extend and promote the use of the Unicode Standard, which specifies the representation of text in modern software products and standards. www.unicode.org
W3C	The W3C Internationalization Activity works within the W3C and together with other organizations to allow and make it easy to use W3C technology worldwide, with different languages, scripts, and cultures. www.w3.org/International/
Webofculture	Webofculture is a website containing information on different regions and cultures. www.webofculture.com

Appendix 3 - Map and route guidance services on the web

The table below lists some examples of internet-based map and route services that are available in different areas. Classification is loose and based on the primary area that the services contain information on.

Finland	Helsingin Sanomat	www.helsinginsanomat.fi/oikotie
	Keltaiset Sivut	www.keltaisetsivut.fi
	Pääkaupunkiseudun yhteistyövaltuuskunta	www.ytv.fi/liikenne/kartat/index.html
France	MapQuest (France)	www.mapquest.fr
Germany	Der Orienierte Mench	www.derorientiertemensch.de/portal/index.php
	Falk	www.falk-online.de/index.jsp
	MapQuest (Germany)	www.mapquest.de
Japan	Mapoo	www.mapoo.or.jp
	Mapfan	www.mapfan.com
	Mapion	www.mapion.co.jp
	S-park	www.s-park.jp
Netherlands	Lokatienet	www.lokatienet.nl
UK	Multimap.com	www.multimap.com
	UpMyStreet	www.upmystreet.com
	MapQuest (UK)	www.mapquest.co.uk
	ViaMichelin	www.viamichelin.com
USA	MapQuest (US)	www.mapquest.com
	Topozone.com (topographical maps)	www.topozone.com
	DeLorme	www.earthamaps.com
Europe	Shell Geostar	www.shellgeostar.com/share
Global	Maporama	www.maporama.com/share