CONSIDERING CULTURAL ASPECTS IN USER INTERFACE DESIGN

A Case Study of the Effects of Culture on User Experience When Localizing a Product from Europe to Japan

Elisa Karpoff

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JYVÄSKYLÄN AMMATTIKORKEAKOULU
JAMK UNIVERSITY OF APPLIED SCIENCES

Author(s)
KARPOFF, Elisa

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Tutor(s)
SIISTONEN, Matti

Assigned by
ETAS K.K.,
Dr. Wolfgang Sienel, President of ETAS K.K.

Abstract
In the globalized world the importance of providing a user interface that is suitable for all users from different cultures has been recognized. As the companies become more international, also the amount of offering that is available becomes larger. It is no longer enough to provide a user interface that is designed for international use, but also recognizing the customer specific needs becomes important. Here user experience and localization become the key terms.

The goal of the thesis work was to investigate if there is a need to provide a localized user interface design for the Japanese ETAS INCA users, as the product is mainly designed in Germany for the global use.

The approach taken in the thesis work was to do a three phase study. The first phase consisted of cultural studies, to recognize the similarities and differences in the two cultures and how these might affect the user interface design. In the second phase a user interface inspection was done by using Japanese cultural heuristics (created as a result of the first phase of the study). The third phase, user research, was done by using three different user research methods: user survey, user interview and user observation.

As a result of the thesis work the Japanese cultural heuristics were noticed to provide useful information about the cultural preferences of the Japanese users for the user interface design. However, these heuristics were also recognized to be useful when designing for other cultures (not just for Japan) and could be used as more of a general guideline. Although cultural issues were noticed in the design of ETAS INCA, were most of the usability issues still general, not Japan specific. Therefore, before providing a localized user interface for Japan, it would be still more beneficial to focus on the general issues.

Keywords
User experience, usability, cultural effects, user study, Japan, user Interfaces, localization, internationalization, cross cultural research.

Miscellaneous
Appendices include multiple documents created as a part of the thesis work (e.g. heuristic evaluation and user research findings, guidelines for conducting the user research), 87 pages.

JYVÄSKYLÄN AMMATTIKORKEAKOULU
JAMK UNIVERSITY OF APPLIED SCIENCES

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SIISTONEN, Matti

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Tiivistelmä
Globalisaation myötä yritykset ovat tiedostaneet kansainvälisten käyttöliittymien suunnittelun tärkeyden, kun käyttöliittymän käyttäjät eivät enää olekkaan vain yhdestä tai kahdesta kulttuurista. Tämä tarjoaa myös asiakkaille laajemmat markkinat mistä valita, jolloin käyttäjäkohtaisten tarpeiden huomioon ottaminen tulee tärkeämmäksi. Tällöin käyttäjäkokemus ja lokalisointi ovat oleellisia käsitteitä.

Opinnäytetyön tavoitetteena oli selvittää lokalisoidun ETAS INCA käyttöliittymän suunnittelun tarpeen sen japanilaisille käyttäjille. Tuote on alkujaan lähtöisin Saksasta.

Työn toteutus oli kolme vaiheinen ja se koostui kulttuurienvälisestä tutkimuksesta, käyttöliittymän kulttuurisesta asiantuntija tarkastuksesta ja käyttäjätutkimuksesta. Ensimmäisen vaiheen aikana tutkittiin Eurooppalaisen ja Japanilaisen kulttuurin eroavaisuuksia käyttöliittymän suunnittelulle tärkeistä näkökulmista. Ensimmäisen vaiheen tuotoksena olivat ns. Japanilaiset kulttuuriheuristiikat. Toisessa vaiheessa suoritettiin käyttöliittymän arviointi käyttäen ensimmäisessä vaiheessa luotuja kulttuuriheuristiikkoja. Työn kolmas vaihe suoritettiin käyttäen kolmea eri käyttäjätutkimusmenetelmää: käyttäjäkysely, käyttäjähaastattelu ja käyttäjähavainnointi.

Opinnäytetyön tuloksena luotujen kulttuuriheuristiikkojan todettiin olevan hyvä menetelmä tunnistaa japanilaisille käyttäjille tärkeitä aihealueita ja että niiden käyttö olisi myöskin hyödyllistä muille käyttäjille suunniteltaessa (kulttuurista riippumatta). ETAS INCA tuotteen kohdalla kuitenkin tultiin siihen johtopäätökseen, että ennenkuin suunniteltaisiin lokalisoitua käyttöliittymää olisi hyvä paneutua yleiseen käytettäyvvteen. Tutkimuksessa huomattiin, että suurin osa havaituista ongelmista eivät olleet kulttuurisidonnaisia, vaikka myös kulttuuriin liittyviä käytettäyvyys ongelmia havaittiin.

Avainsanat (asiasanat)
Käyttäjäkokemus, käytettävyys, käyttäjätutkimus, kulttuurivaikutukset, Japani, kulttuurienvälinen tutkimus, käyttöliittymät, lokalisointi, kansainvälistyminen.

Muut tiedot
Liitteenä useita opinnäytetyöhön tehtyjä dokumentteja (mm. Heuristisen analyysin löydökset, käyttäjätutkimuksen löydökset, ohjeita käyttäjätutkimuksen suorittamiseen), 87 sivua.

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1 INTEREST FOR LOCALIZATION

1.1 From Global to Local

The world that we live in keeps on getting smaller and smaller as the technology develops. Boarders of the countries are starting to dim and most of the people have become used to interacting daily in an international environment –The Internet.

The business world has also realized these possibilities that exist in foreign countries. As each of the countries, cultures and regions differ greatly from each other in the matters of language, as well as other cultural aspects, the importance of designing products that are suitable for multiple cultures has become necessity. In the world of software development, this most commonly means offering the user interface in English, which is seen as a language that is most widely used in the cross-cultural communication.

However, as the amount of offering that is available becomes greater the ability to satisfy the customer specific needs for the user interfaces becomes the measure in which the investment decisions are based on. Here is where user experience and localization become the key terms.

1.1.1 User Experience

One of the factors affecting a product's success is the end-user experience of it. Although good user experience cannot guarantee the success of a product, a bad one can surely cause a failure of it. As each person experience the world differently, the factors that create a good experience depend on the people, product and task. (Kuniavsky 2003, 18)

Different definitions of what the user experience consist of exist. Kuniavsky (2003, 18) defines user experience by what is “usable”. The definition of “usable” is described to consist of the functionality of the product, the efficiency in which the tasks can be conducted and the desirability factor that the product has (Kuniavsky 2003, 19-20). Siistonen (2012a, 2) gives more detailed explanation by defining that user experience consists of design, fashion, technology, price, brand and usability of the product.

At ETAS the definition of user experience is provided from Bosch. It includes “all aspects of the user’s perception regarding an offering, including the product itself, its functionalities and HMI, as well as related products, services and business eco-systems.” Five target states have been stated for product’s user experience: usefulness, ease-of-use, joy-of-use, aesthetics and image-of-use. (Schick 2013)

1.1.2 Localization

Del Galdo and Nielsen (1996, vi) describe that there are three levels of localizing a user interface (see figure 1). The first steps that are taken towards providing international user interface (providing localized user interface) usually includes the translation to the local languages, character sets and notations. This will make the user interface comprehensible for the user. The next step would include factors that would improve the usability of the system, by adapting to its time zone, date format, currency and measure standards that are in use in the target culture. (Shen 2000)

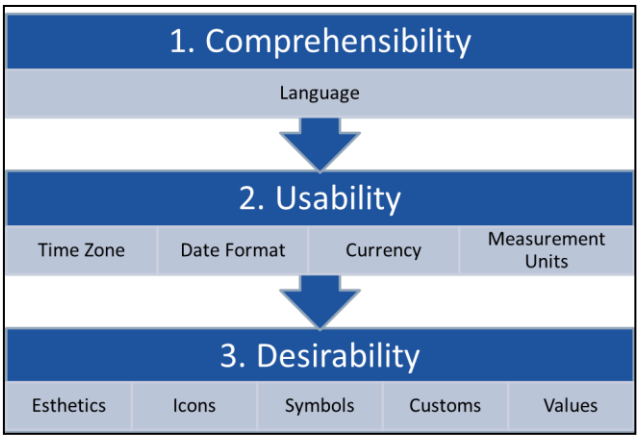

Figure 1. Levels of user interface localization (based on Shen 2000).

The focus of the thesis work is in the third level of localization: desirability. Providing a user interface that is desirable includes the adaptation of it to the users' cultural characteristics (Shen 2000).

1.2 Approach of the Thesis

The approach taken in the thesis work to learn about the Japanese INCA user experience was to conduct three phase study consisting of cultural studies, cultural user interface inspection and user research (see figure 2).

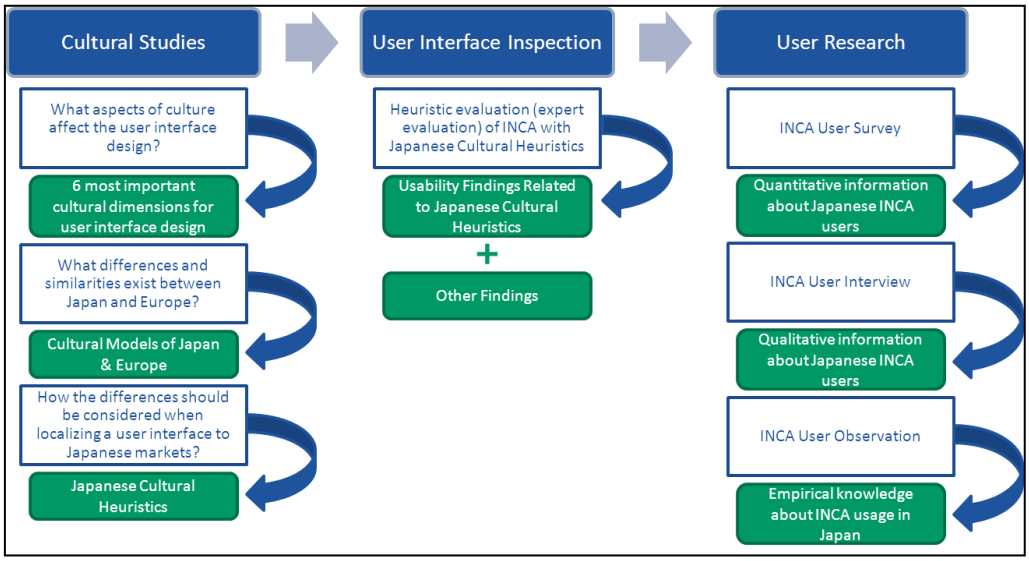

Figure 2. Phases of the thesis work.

First step was to study about the cultural differences between Japan and Europe through six dimensions of culture that were found to be the most important ones for user interface design in Baumgartner's (2003) thesis work. Based on the research hypotheses were made about the topics that influence the user interface design for Japanese users (later referred to as Japanese Cultural Heuristics).

The representation of these topics in INCA was evaluated through heuristic evaluation. The heuristic evaluation also served as a way to evaluate the additional value that using the Japanese Cultural Heuristics could provide.

The final phase was to do a user research with the actual Japanese INCA users to identify issues that were not noticed in the expert evaluation, as well as to gain both quantitative and qualitative data about the users; and empirical knowledge about the working environment and tasks of the users. The user research enabled to check the feasibility of the hypotheses created in the first phase of the study.

1.3 ETAS Group

ETAS GmbH was found in 1994, when Advanced Engineering department at Robert Bosch Embedded Control group recognized the possibilities of using their tools (with few minor modifications) in almost any type of embedded control units (ECUs) (INCA User Training Manual 2010, v). ETAS GmbH is a subsidiary of Bosch Group (ETAS Group n.d.).

Although the origins of the company are in Stuttgart, Germany; the company has expanded with international subsidiaries and sales offices to 12 other countries including Brazil, China, France, India, Italy, Japan, Korea, Russia, Thailand, United Kingdom, United States of America and Sweden. (ETAS Group n.d.)

1.3.1 INCA

The system studied in the thesis work is ETAS INCA that is targeted for the calibration and measuring tasks of electronic control units (ECU).

Calibration Setup

A typical calibration setup (see figure 3) consists of the INCA software and hardware. Hardware is connected between the computer operating INCA software and the ECU that is being calibrated. Multiple different types of hardware exist and the type that is being used depends on the target system: mainly on the ECU and the interfaces that the ECU provides, as well as on the additional (non-ECU) measurement modules and on the connections to the bus systems. (Gekeler 2013)

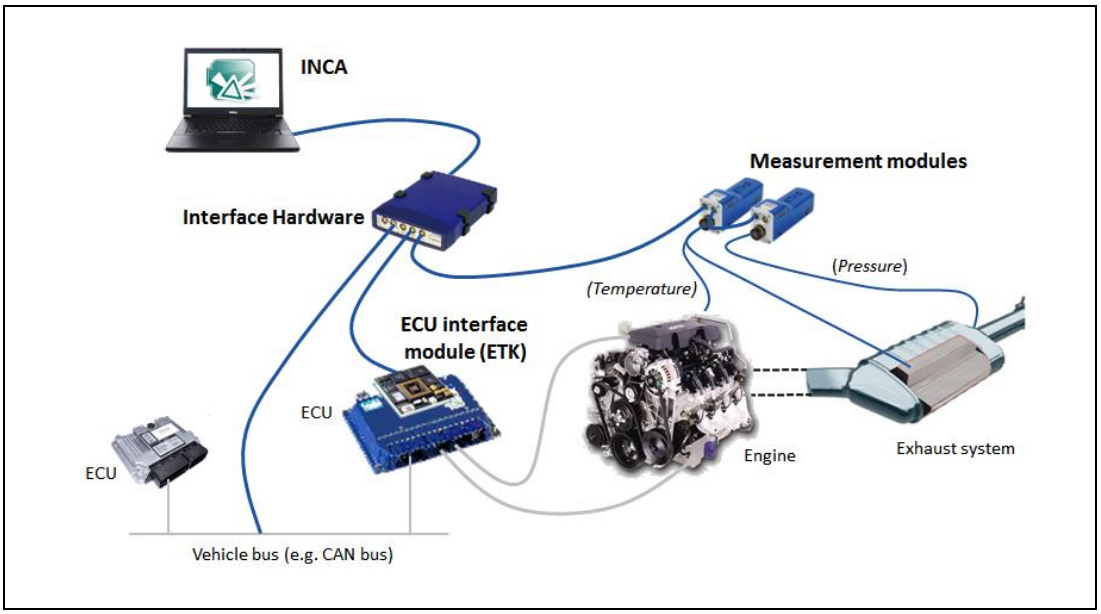

Figure 3. Typical calibration setup. Calibration system presented with blue lines. Presented by Gekeler 2013.

Tasks with INCA

There are multiple different types of tasks that can be done with INCA. The main focus is in the calibration tasks to optimize the behavior of a system controlled by an ECU. Optimization of such a system in the automotive industry may be for example an engine to reduce the amount of fuel consumption, to optimize the combustion

process to reduce exhaust gases or to enable smooth start of the engine in cold temperatures. (Gekeler 2013)

To perform calibration, the user of INCA observes the behavior of the system controlled by the ECU (for example an engine) by doing acquisition of relevant measurement values. These values are depending on the data which is stored in the ECU and used by the ECU program code. By changing the calibration data the user can change the behavior of the engine system. (Gekeler 2013)

Main Functionality of INCA

INCA enables the recording of the measurement samples acquired from the ECU, measurement modules and vehicle busses; and then the analysis of the recorded data. Besides the measurement samples INCA shows datasets internally in a database. These datasets contain either the original unchanged data or the data changed by the INCA user. (Gekeler 2013)

Calibration Process

Usually several calibration engineers work individually on different tasks which are divided by different calibration parameters within the ECU. Combining these individual working results into one dataset and repeating another (or several) iterations of optimization eventually results in an optimized dataset, which is actually used for the serial production of engines for respective vehicles. (Gekeler 2013)

1.3.2 Interest for Japanese User Experience

There are multiple reasons for the special interest of the Japanese user experience. For one, Japan is one of the top car manufacturers in the world. According to the International Organization of Motor Vehicle Manufacturers (OICA) in 2012 Japan produced the third most cars in the world, increasing the amount by 18.4 percent from the previous year (2012 Production Statistics). As the main customers of ETAS

products are in the automotive industry, it seems reasonable to focus on the increasing markets.

Another reason is the difference in the culture of the Japanese automotive industry to other Asian markets. As the other important markets in Asia (such as Korea and India) rely greatly on the development done in Europe (Koreans adapting to European tools and Indians modifying the European tools to be simplified for their own purposes) is Japan different compared to them. The Japanese automotive industry has been known to develop its own methods, rather than using the already existing ones. Therefore it was seen as important to recognize the special needs of this market. (Sienel 2013a)

2 CULTURAL STUDIES

To limit the extent of the study, it is important to define which aspects of culture are being studied. In the following chapters the definition and structure of culture is first examined, followed by descriptions of aspects (or “dimensions of culture”) that have been found to be the most important ones for user interface design in previous studies (cf. Baumgartner 2003).

Japanese and European cultures are studied through the cultural dimensions to discover the aspects that are similar and different in the two cultures. Based on the differences found descriptions of “Japanese Cultural Heuristics” are given to show the aspects that should be recognized when creating a user interface for Japanese markets.

2.1 Culture

In her article Hoft describes culture accordingly: ”Culture is, after all, learned behavior consisting of thoughts, feelings and actions”. Even after providing that description Hoft states the complexity of giving exact definition of culture. Hoft describes that Kroeber and Kluckhohn (1954) have reported more than 300 definitions of culture. (Hoft 1996, 41 & 71)

Expanding from Hoft’s description of culture Merriam-Webster Online Dictionary (Culture n.d.) defines more specifically the nature of culture:

> *Integrated pattern of human knowledge, belief, and behaviour that is both a result of and integral to the human capacity for learning and transmitting knowledge to succeeding generations. Culture thus consists of language, ideas, beliefs, customs, taboos, codes, institutions, tools, techniques, works*

> *of art, rituals, ceremonies, and symbols. It has played a crucial role in human evolution, allowing human beings to adapt the environment to their own purposes rather than depend solely on natural selection to achieve adaptive success.*

This description includes the consistent development of culture, which allows it to adapt to the existing environment that it is in. The development of culture can be seen to be crucial to the human evolution as the environment is constantly changing. Culture *has to* develop in order to survive.

2.1.1 Metamodels of Culture

While investigating culture it is important to be able to state what exactly in the culture is being investigated. Hoft (1996, 43-48) presents four well known metamodels of culture that can help to identify the different layers of culture:

1. objective and subjective culture
2. iceberg model
3. pyramid model
4. onion model.

The clearest model of culture when thinking about the aspects of culture that are included in the third level of user interface localization, provide the model of objective and subjective culture.

Objective and Subjective Culture

According to Hoft; Stewart and Bennet (1991) have introduced a model of two layers of culture: objective and subjective culture. By their definition objective culture includes variables that are visible in the culture, thus easy to discover. These include tangible dimensions such as ”social customs, political structures and processes, arts, crafts and literature”. Subjective culture on the hand is seen as something that

is ”outside the conscious awareness” of the person. This would include dimensions such as assumptions, values, and patterns of thinking, which are psychological features of culture. Despite the fact that the subjective and objective culture seem to be the opposite sides of a coin, they are closely related to each other according to Stewart and Bennet. They explain subjective to be what is real and concrete and the objective to be the externalization of the subjective culture, hence abstract. (Hoft 1996, 43)

2.2 Dimensions of Culture for User Interface Design

Dimensions of culture (sometimes referred to as international variables) are used to organize cultural data in categories in which they can be compared to other cultures (Hoft 1996, 49 & 69). Different authors have created their own dimensions to categorize the cultural data, which sometimes can be compared to other author’s dimensions or are even based on other author’s dimensions. Authors of these dimensions include such as Edward T. Hall (anthropologist), Geert Hofstede (diploma in mechanical engineering and Doctor of Social Science), Fons Trompenaars (Economics and Ph.D. in a dissertation on differences in conceptions of organizational structure in various cultures), David A. Victor (Professor of Management) and Quincy Wright (author of ‘The Study of International Relations’). (Baumgartner 2003, 18-19)

Baumgartner studied in her thesis work the importance of 29 different dimensions of culture (collected from nine authors) to user interface design. In her thesis work she conducted qualitative research to over 50 user interface design experts to discover the most important cultural dimensions for user interface design. Based on the results of the survey she created a ranking of the most important cultural dimensions for user interface design. The six most important cultural dimensions were (in this order): context, environment and technology; uncertainty avoidance, technical development, time perception and authority conception. In the following are

described these dimensions of culture and their influence to user interface design. (Baumgartner 2003, 39-46)

2.2.1 Context

Context is a cultural dimension created by Edward T. Hall, an anthropologist and intercultural communication consultant whose work is based on years of observation and extensive interviewing worldwide. (Hoft 1996, 50)

Hall divides cultures to high- and low-context cultures. In high-context culture the information provided is implicit and context plays a big role in the communication. On the other end, in low-context culture the amount of information is large and the context plays very small role in the communication. Hall provided a Context Square (see figure 4) to visualize the contrast of information, context and meaning. (Hoft 1996, 51)

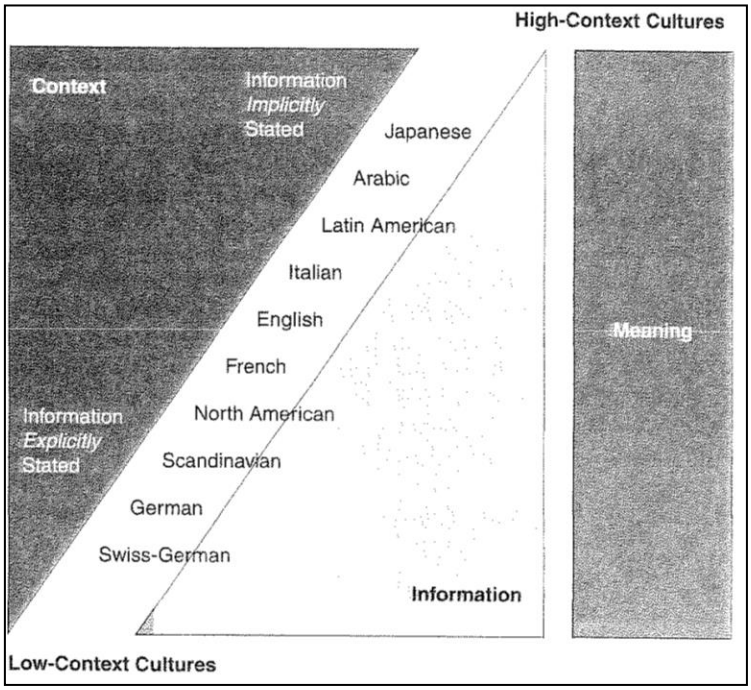

Figure 4. Hall's Context Square combined with Victor's diagram of high- and low-context cultures (Hoft 1996, 52).

User interface design professionals that participated in Baumgartner's survey describe: "navigation and interaction can be supported positively with high-context graphic, but only in cultures where high-context communication is common and can be understood". Another participant describes the effect of context by giving an example of hospital information system, where the user's professional knowledge from 3 to 15 years of training covers 98% of the communication and the user interface only 2%. (Baumgartner 2003, 24)

2.2.2 Environment and Technology

David A. Victor's dimensions of culture are based on extensive academic research. Victor sees the cultural differences and similarities essential in effective international business communication. (Hoft 1996, 55-56)

Victor's environment and technology dimension describes how the experience of nature affects culture's experience of technology. There are three different orientations that the culture may have:

1. Control-oriented: environment is seen as something to be mastered, which can be done through technology. Technology is seen as positive.
2. Subjugation-oriented: environment is experienced to be controlling the society; it is not possible to control the environment. Technology is seen as neutral or negative.
3. Harmonization: people feel that they are part of the environment, they are neither subjects of it nor do they want to control it. Technology is seen as part of the environment. (Baumgartner 2003, 26)

Some of the participants of Baumgartner's study mention that it does not matter how well something is designed if people don't use it. One of the participants gives an example from United States of America that is mentioned to be control-oriented

culture: technology is seen as ”smart” and ”good”, if the users do not know how to use something they feel that they are not smart enough. (Baumgartner 2003, 26)

2.2.3 Uncertainty Avoidance

Geert Hofstede did an extensive research with IBM employees during years between 1968 and 1972. He bases his cultural dimensions in that research. (Hoft 1996, 57-58)

Uncertainty avoidance dimension is meant to discover the culture’s ”extent to which people feel threatened by uncertain or unknown situations”. He measures the level of uncertainty avoidance from high to low:

1. High uncertainty avoidance: uncertain situations are seen dangerous, people tend to avoid them. The culture has suppression of deviant ideas and behavior, different is dangerous.
2. Low uncertainty avoidance: less threatened by unknown situations. Uncertainty is part of life. The culture sees different as curious and there is tolerance of deviant and innovative ideas. (Hoft 1996, 60-61)

For user interface design Baumgartner links uncertainty avoidance to the design of navigation and interaction. ”Satisfying the need of certainty will affect the satisfaction that the user experiences on the interface and hence determine the ”stickiness” for a particular population”. (Baumgartner 2003, 38)

2.2.4 Technological Development

Quincy Wright’s technological development dimension is used to describe the rate of the culture’s technological development. He uses scale from advancement to backwardness. (Baumgartner 2003, 35)

Baumgartner's study connects technological development to mental models, navigation and interaction in user interface design. Not only may the technological development level affect the availability of hardware, software and bandwidth, but also the experience level that the users may have with technological products. This affects the design of the user interface critically. (Baumgartner 2003, 36)

2.2.5 Time Perception

Cultural dimension of time perception is described by Hall, Trompenaars and Victor. It is used to describe how the time is used within a culture:

1. Monochronic (sequentially) time: preference in the use of schedules, promptness, compartmentalization and isolation of actions. Things are done one at a time and it is important to stay in schedule.
2. Polychronic (synchronically) time: prefer doing multiple tasks at once, plans are changed easily, schedules are not followed rigidly. (Baumgartner 2003, 37)

Baumgartner links time perception to navigation, interaction and appearance in user interface design. It may affect the way in which the user browses for information: monochronic would prefer precise query whereas polychronic would like to browse for the information freely. The age of the user may affect this factor more greatly than the ethnic or regional cultural background. (Baumgartner 2003, 37)

2.2.6 Authority Conception

According to Baumgartner the authority conception dimension presented by Victor and Condon & Yousef describes culture's conception of organizational power. Cultures can be divided into three categories: democratic, authority-centered and authoritarian. In democratic cultures young people are thought that they have the right to question the authority. In authoritarian cultures this is not allowed. (Baumgartner 2003, 23)

When thinking about user interface design authority conception of the culture should be considered when thinking about the metaphors, mental models and interaction that is used. The user may want to know that the usage of the software is done under surveillance of an authority. Phrasing the commands and text in the software needs to be carefully thought; and the style of the text should match the cultural and social profile of the user. The interaction approach should be thought carefully – if it is seen by others, the user should not be put into uncomfortable or embarrassing situations. The presentation of the feedback should be carefully thought. (Baumgartner 2003, 23)

2.3 Japanese and European Models of Culture

Using cultural models was evaluated to be the most feasible method to collect information about the cultural differences between Japanese and European cultures that might affect the user experience.

The Japanese subjective dimensions of culture were created by collecting data from existing literature (cf. the Hofstede Centre) on Japanese culture and by empirical observations that the author did while living in Japan during the thesis work (from December 2012 till June 2013). The European dimensions of culture were also defined by using already existing knowledge (cf. the Hofstede Centre).

Because of the wide range of different cultures in Europe, it was not feasible to conduct more thorough research within extent of the thesis work. Therefore, most of the European cultural dimensions were based on the empirical observations that the author had done about the European cultures while studying a year in Spain, doing an internship in Germany for six months and having grown up in Finland. During these times spent abroad as well as during her studies in Finland she had been living,

studying and working in international environments, during which recognizing the cultural differences was part of daily life.

In the following chapters are presented they ways in which the differences in the different cultures can be shown and how Japanese and European cultures measure in them.

2.3.1 High vs. Low Context

Hoft presented in her article a figure (see figure 4) that included Hall's Context Square combined with Victor's diagram of high- and low-context cultures. In this diagram Japanese culture is ranked as high-context culture whereas German, Scandinavian and North American cultures are ranked to low-context. Italian, English and French cultures rank in the middle of the diagram. (Hoft 1996, 52)

Würtz (2005) brings up the differences of communication in high- and low-context cultures originally identified by Gudykunst et al. (1996). In the following figure 5 these characteristics are being used together with non-verbal/less physically animated communication strategies presented by Hall (1976) according to Würtz (2005) to create a semantic differential scales to evaluate the differences in the cultures. Japanese and European cultures are placed in these scales by presenting Japanese culture with green balloon and European with blue balloon. The ratings are explained in the following paragraphs.

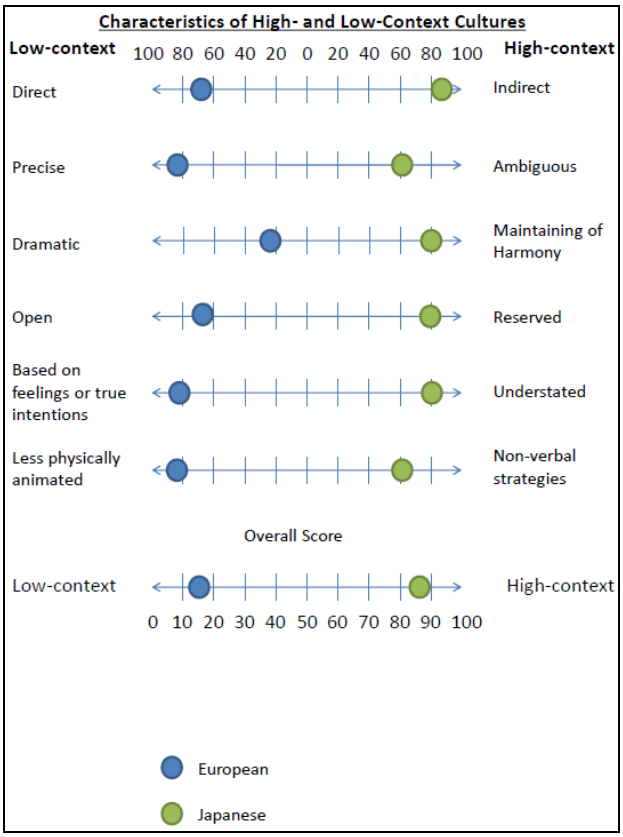

Figure 5. Semantic differential scales of characteristics of low- and high-context cultures.

Direct vs. Indirect

Japanese value harmony which extends also to communication. The listener should be able to understand from other signs what the speaker's real intentions are. Norbury describes actions such as pause in the speech, body language and not responding to be perceived as negative replies instead of using direct "no". (Norbury 2011, 41 & 149)

Nishimura, Nevgi and Tella studied the cultural features of high- and low-context cultures in Finland, Japan and India. In their study they present a diagram by Lewis (2005), showing the differences in communication styles in USA/West Europeans – Finns – Asians. In this diagram USA/West Europeans and Finns have in common the "truth before diplomacy" factor, whereas Asians have the tendency for "diplomacy before truth". (Nishimura, Nevgi and Tella 2008, 788) This factor presents well the directness of the European culture – the truth is being told directly, even when it

might not be beneficial to the participant that is in hierarchy higher than the speaker. Truth and directness is valued over the diplomacy of the situation.

Precise vs. Ambiguous

Nishimura et al. offer an example how the ambiguity of the Japanese culture is presented within the language by providing the following sentence: “KISHA no KISHA ga KISHA de KISHA shimashita”(貴社の記者が汽車で帰社しました). This means: “a reporter of your company returned to the office by train”. In each case “KISHA” has a different meaning that can be only understood based on the context while speaking. In written language they are separated by using different kanji characters for each meaning (貴社, 記者, 汽車 and 帰社). (Nishimura et al. 2008, 790)

In Europe ambiguous answer to a question could be understood as dishonesty or that the person does not know the answer. Things are expected to be stated precisely and in a case of uncertainty it is more than desirable to seek for an answer, rather than to be unsure.

Dramatic vs. Maintaining of Harmony

While discussing with a Japanese person you cannot hear them disagreeing or saying “no” in any situation. For Japanese saying “no” is considered to be harsh and even rude. The person may say that it might be difficult to do something or that they would need to considerate the answer a bit more, which could be understood as negative response. (Norbury 2011, 149-150)

On the contrary in Europe the people are expected to express their real feelings and opinions about the topic openly. Exaggerating can be seen as a way to express the seriousness of one’s opinion. The dramatic manner may be also used when people want to put pressure on a topic. Though, dramatic communication is less used by Northern Europeans compared to the more temperamental Southern Europeans.

Open vs. Reserved

Europeans are more individualist than Japanese. Showing one's opinions and feelings is seen as each individual's right in the society. On the contrary, in Japan the individuals have the obligation to the society to reserve their feelings and opinions from the public to obtain harmony in the society. This is supported by the strong "face" culture that exist in Japan – actions should be carefully thought to prevent losing face (Norbury 2011, 43).

Interestingly the loss of face do not only limit to the person that is acting exceptionally, as the following story shows.

During my stay in Japan I joined a gym with my Korean housemate. The gym offered different types of dancing classes in which we also joined. In one of the times that we joined these classes I was wearing a top instead of the usual t-shirt. As the lesson started my housemate, who had already been living in Japan for a while, told me that my revealing outfit was causing embarrassment to everyone in the class. It was difficult for me to understand why the others would be embarrassed because of something that I was wearing. In Finland that may have caused some curious looks from the fellow gym goers, but definitely not embarrassment for them.

Based on Feelings vs. Understated

Like mentioned before, Japanese live in "face" culture. Maintaining one's face is important, which is why the culture has developed so many different customs and protocols for both business and daily life to prevent losing face. There are two aspects of Japanese person: *tatemai* (public face) and *honne* (private face). *Tatemai* is what can be seen from the person in public, when the true intentions are hidden. *Honne* includes the honest intentions of a person that are not shown in public. (Norbury 2011, 41-44)

The European cultures are more open and prompt the openness and each individual's right to show their real feelings and opinions in public. In Spain you can

experience the people's openness as they openly express their delight of meeting friends and family by greeting them loudly with rich expression, accompanied by multiple cheek kisses and taps on the shoulder. Whereas in Germany and Finland the openness is shown as the people are expected to express their real opinions and feelings truthfully with courtesy. This may cause tension between the people with different opinions, but everybody's opinion is heard and hopefully a way that would satisfy both parties can be sought.

Less Physically Animated vs. Non-verbal Strategies

In Japan unspoken things, gestures and body language play a big role in the communication. Manners, such as bowing and pauses in the speech are important part of the communication. Understanding the non-verbal strategies is a required when communicating in Japan. (Japanese Communication Style n.d.)

The importance of body language is recognized in Europe too, though the main pressure in the communication remains in the verbal communication. Something that is not said or written cannot be expected to be understood.

2.3.2 Harmonization vs. Control-Orientation

As described before (see chapter 2.2.2), culture may have one of the three orientations towards environment and technology: control-oriented, subjugation-oriented or harmonization.

Figure 6 is an attempt to demonstrate how these categories are defined by the perception that each of them have towards environment and technology. The table is created based on the definitions of each of the orientations in Baumgartner (2003, 26).

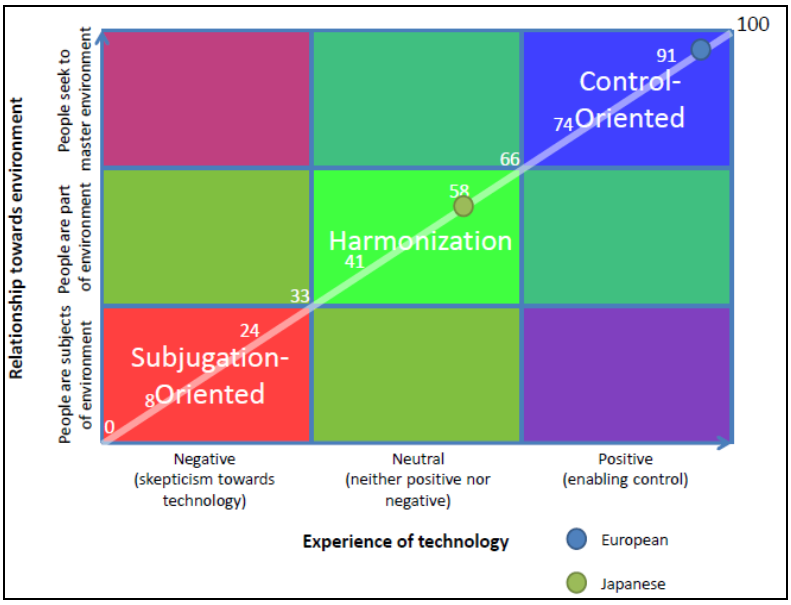

Figure 6. Culture's perceiving of environment and technology –chart.

Harmonization of Environment and Technology in Japan

Japan is one of the world's most dangerous areas by the means of tectonic plates. Four tectonic plates meet under the Japanese archipelago, creating a continuous threat of earthquakes in daily basis. Besides this threat Japan has one of the world's most hazardous climate zones. Rapid weather changes from cold to warm, as well as the possibilities of extreme weather phenomenon such as snow storms and typhoons are to be expected in Japan from time to time.(Norbury 2011, 14- 16)

Japanese have developed technological ways to support the living in the dangerous environment and ways to adapt to the ever-changing weather conditions. They do not attempt to control the environment, but find ways in which living in these conditions can be enabled and made enjoyable.

During the first week of my internship in Japan I was given instructions on what to do in case of an earthquake. After going through all the safety instructions, the Japanese person giving the presentation could see that I was a bit scared. After explaining that we are well prepared for earthquake and tsunami risk she told me: "In a case of earthquake everybody is in the same situation, there is nothing more that we can do

than what I have already explained to you". That sums up well the mentality of Japanese towards environment – it is neither desirable nor possible to change the environment, you just need to find a way to survive and adapt to it.

The relationship towards nature is also part of the Shinto religion that is the dominant religion in Japan. As Nurbury (2011, 52) puts it: "seeking of harmonious relationship with nature lies at the heart of Shinto".

European Control-Oriented Culture

Similar to Japan, technology is widely used in daily living in Europe. It is experienced positively and the interest in new technology is tremendous. The biggest difference between Japan and Europe may be the perceiving of technology: in Europe it is separated from the environment.

A good example of this could be my father, whose mission seems to be to fill up my parents' house with multiple different kinds of technological gadgets for any kind of task that you could imagine to have in a house or daily living. It is not that these gadgets are necessity or embedded part of the living environment, but more the feeling of control that they create to my father. May it be the mechanic snow remover or remote control to turn on the coffee maker without having to stand up from the kitchen table for it. As he usually prefers doing the snow work anyways the old-fashioned way or will turn on the coffee maker while preparing the breakfast; are these gadgets there only to provide the feeling of control that he has with them over his living environment.

2.3.3 High vs. Low Uncertainty Avoidance

The Hofstede Center's website offers collected survey data about the five cultural dimensions created by Hofstede about different nations. The website provides each country's score of each of the dimensions and a description of the score. The scores

presented in the website are meaningless unless comparisons between different countries are done. (The Hofstede Centre n.d.)

The data from the Hofstede Centre's website was used to evaluate the uncertainty avoidance levels of European and Japanese cultures.

The scores in uncertainty avoidance of the countries were categorized to provide analysis base for different countries. Scores within the sample ranged from 23 (which was categorized as low in the descriptions) up to 112 (which was described as the highest score) (The Hofstede Centre n.d.). The categories provided in the figure 7 are based on the descriptions given with the scores of each country as well as the estimation done by the author.

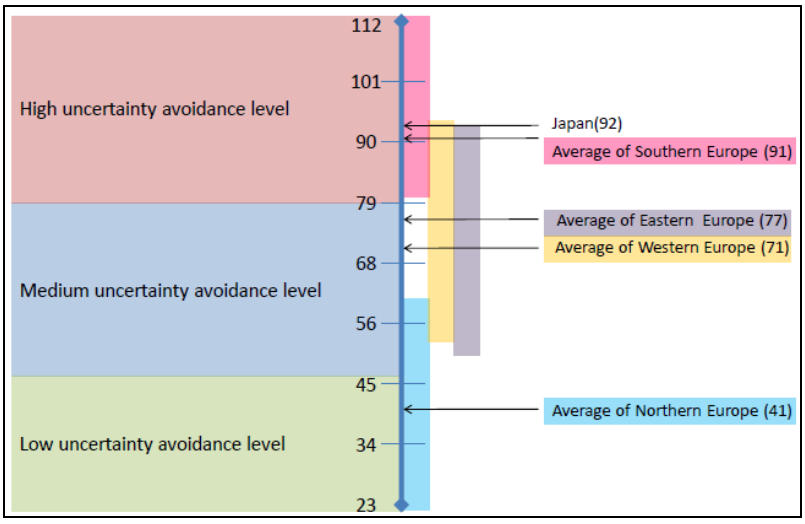

Figure 7. Categories of uncertainty avoidance (based on the Hofstede Centre n.d.).

High Uncertainty Avoidance in Japan

Japan scores 92 in the uncertainty avoidance scale, which puts it to the countries of high uncertainty avoidance. In the Hofstede Centre's website this is described to be a result of the huge risk of natural disasters (earthquakes, tsunamis and typhoons). Because of the high risk of the natural disasters, the people are at all times well prepared for them and multiple ways of handling such situations have been

developed (such as emergency protocols and preparations of the houses for the catastrophes). (The Hofstede Centre n.d.)

The high preference for uncertainty avoidance is every presence in the daily living and multiple different traditions have been developed to avoid uncertain situations, such as the manners of communication and interacting with others to avoid situations that are not familiar.

Another example of the uncertainty avoidance is the high preference of knowing what topics will be discussed in a meeting before the meeting and if some sort of input is required during the meeting.

One time during my stay in Japan I got a chance to take part in one of the team meetings in the company, to provide information about user experience and the topics of the thesis work for the Japanese colleagues. After my presentation the German team leader wanted to have a bit of discussion with the team about user experience, to see if they had understood the concept. He was asking them to give an example of good or bad user experience that they had experienced recently. The silence in the group continued for a good while, until one of the team members asked in disbelief: "Are you asking us to give an example NOW?" Although the matter was not about any bigger topic, were the Japanese in discomfort about providing an answer to a question without having the time to prepare so that they could be sure that it is the correct kind of answer.

Uncertainty Avoidance in Europe

Europe constructs of multiple different cultures, which each have their own and quite radically different score for uncertainty avoidance. European Union consists of 27 countries (Countries n.d.). From these 27 countries the data of 21 countries was collected, excluding Cyprus, Latvia, Lithuania, Luxembourg, Malta and Romania. Besides these countries the data from Norway, Switzerland and Croatia was also collected, as their location in the European area was evaluated to entitle them to be

included in the range of this thesis. In total information of 24 countries was used (see appendix 1).

The average score of uncertainty avoidance in European countries is about 69, which would put Europe in the medium uncertainty avoidance level –category. Since there are great differences, it is preferable to have a closer analysis of these scores.

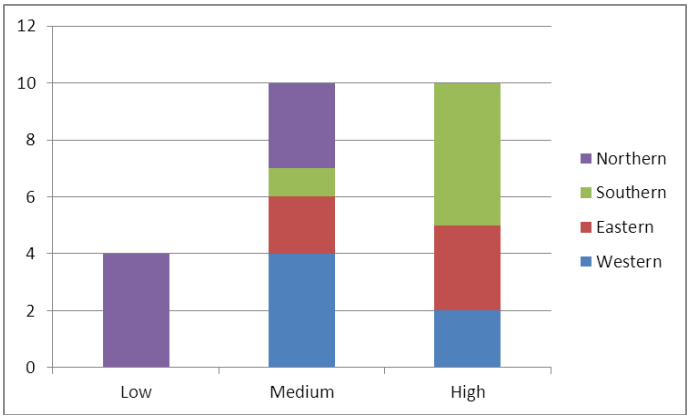

Figure 8. Distribution of level of uncertainty avoidance in different regions in Europe.

As can be read from figure 8 the distribution of level of uncertainty avoidance in different regions of Europe differ quite a bit. Northern Europe has lower scores in the uncertainty avoidance, whereas Southern European countries have almost solely high uncertainty avoidance levels.

Southern European countries are described to have a lot of rules and regulations to support the daily living and to avoid uncertainty, although these rules may be obeyed only when it is feasible. People express their feelings strongly, since the uncertainty in situations raises strong feelings of not being in control of the situation and the fear of unknown. ”Countries exhibiting high uncertainty avoidance maintain rigid codes of belief and behaviour and are intolerant of unorthodox behaviour and ideas”. (The Hofstede Centre n.d.)

The strength of the Catholic Church in Southern Europe can be seen as one result of the high uncertainty avoidance level. The church offers rules and answers to different aspects of people's lives, thereby reducing the uncertainty.

Four out of the seven Northern European countries that were researched had low uncertainty avoidance level. None of the countries had high uncertainty avoidance level and the three with medium level of uncertainty avoidance all had scores lower than 60. What is described to be common in these countries is that the laws and rules that exist (not so many of them) are the ones that are really necessary and will be followed precisely. New and different is seen positive and innovative ideas are valued. (The Hofstede Centre n.d.)

As can be read from figure 8, Eastern and Western countries of Europe are divided almost equally to medium and high uncertainty avoidance. It can be described that the cultures in the medium category prefer to have structure and predictability in their lives, security is also important. In some countries the certainty is reach through education and concepts that provide detail, context and background (e.g. France and Germany). (The Hofstede Centre n.d.)

2.3.4 Leaders in the Technological Development

The cultural dimension of technological development shows how developed the culture is in the sense of technology. Baumgartner (2003, 35) describes technological development to have a scale from ”backwardness” to ”advancement”.
Archibugi and Coco (2004) studied the culture's technological capabilities. Nations were ranked from ”leaders” to ”marginalized” depending on their technological capabilities (Archibugi et al. 2004). The technological capabilities that a culture has can be reflected to its technological development. A culture that has not developed technologically does not hold technological capabilities either. These two scales are combined in the figure 9.

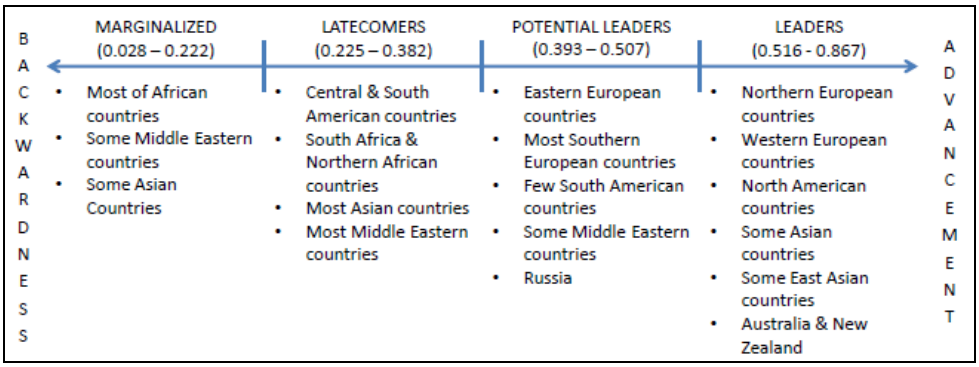

Figure 9. Categories of technological capabilities on the scale from backwardness to advancement (categories from Archibugi et al. 2004).

In the following chapters are described the method in which the countries were ranked for their technological capabilities in Archibugi et al. (2004) with ArCo index and why this ranking is still valid, even approximately a decade after its development.

ArCo Index

Archibugi et al. present a way of evaluating different countries' technological capabilities through ArCo index. ArCo index uses three dimensions that are constructed from sub-indexes to evaluate the technological capabilities of a country (see figure 10). An equal value is given for each of these dimensions in creation of the technological capability index. The data for the sub-indexes was collected from multiple sources, such as US Patent and Trademark Office, the World Bank's database, US National Science Foundation and CSRS. The bigger index number the higher country's ranking is on the list of technological capabilities (the highest score that could be achieved is 1,000). The 162 countries that are ranked are categorized into four categories: leaders, potential leaders, latecomers and marginalized (see figure 9). (Archibugi et al. 2004, 630 & 632)

TECHNOLOGICAL CAPABILITIES		
	Creation of Technology	Patents
		Scientific Articles
	Technological Infrastructures	Internet Penetration
		Telephone Penetration
		Electricity Consumption
	Development of Human Skills	Tertiary Science and Engineering Enrolment
		Mean Years of Schooling
		Literacy Rate

Figure 10. Technological Capabilities (based on Archibugi et al. 2004).

The Validity of ArCo Index from 90's in 2013

The values of ArCo index were collected from the end of 90's. Since then the world has changed and the technology has advanced greatly in every way. In the developed world mobile phones have become more and more widely used and Smartphones are taking over, including functions that before were only common for computers. The competition has changed from the functions available to easy-to-use and easy-to-learn. The time spent on learning how to use new technology is seen as the new determinative factor while choosing between similar products.

To offer a more up to date comparison point for the presented values of ArCo a Global Technological Ranging was studied. In Global Technological Ranking presented in Florida, Mellander, Stolarick, Silk, Matheson and Hopgood (2011, 32-33) the ranking of the countries is based on three dimensions: research & development investment, researchers and innovation. The data is collected from the years 2000 to 2008 from 75 different countries (Florida et al. 2011, 32-33). Although the sample is quite a bit smaller than in the ArCo index, can similarities be seen: Northern & Western European countries; Australia, New Zealand, North American countries and few East Asian countries (Japan, Republic of Korea and Singapore) are on the top rankings (leaders). Southern and Eastern European countries follow the top, with Russia and China (potential leaders). In the lower rankings are Central and Southern

American countries as well as Asian countries. Since almost none of the marginalized countries are included in the ranking, it can be inferred that the lower rankings are comparable with the latecomers of the ArCo index.

Therefore, even with the great changes and development that has happened during the last decade, most of the regions can be said to be in almost the same positions in the technological development as in ArCo in 2004. The same countries are in the leading positions, even though the places may have slightly changed (see figure 11).

	ArCo Ranking 2004	Global Technology Ranking 2011	Change in Ranking
1.	Sweden	Finland	+1
2.	Finland	Japan	+6
3.	Switzerland	United States	+2
4.	Israel	Israel	0
5.	United States	Sweden	−4
6.	Canada	Switzerland	−3
7.	Norway	Denmark	+2
8.	Japan	Republic of Korea	+11 (19.)
9.	Denmark	Germany	+3 (12.)
10.	Australia	Singapore	+11 (21.)

Figure 11. Changes in the top places of country rankings in technological development. Data extracted for ArCo Ranking from Archibugi et al. (2004, 637) and Global Technology Ranking from Florida et al. (2011, 32).

European Technological Development Level

The European countries differ from each other in this dimension slightly. Northern and Western European countries rank higher than Southern and Eastern European countries, albeit staying in “potential leaders” category. While looking on to the countries that were used to evaluate the uncertainty avoidance level (see page 28), the average of these countries ArCo index is 0.588, which would place them in the leaders category.

When thinking about the factors that were used to create the ArCo and Global Technology rankings, it can be said that most European countries do well in them. Internet and telephones (already moved more to mobile phones) are things that

people are expected to know and use (except of the older generations). Electricity consumption has gone even so high that people are seeking of ways to use less electricity after realizing the environmental harms that are caused by the use of electricity. New more environmentally friendly ways are developed to generate electricity to cherish the nature.

Since European countries are listed as developed (Developed and developing regions n.d.) the basic education level is quite high compared to the developing countries. Countries such as Germany and Finland are famous of their engineering skills (Germany of mechanical engineering (e.g. Audi, Bosch, Daimler, and Porsche) and Finland of the information technology (e.g. Linux, Nokia)).

Japanese Technological Development Level

In ArCo index Japan scores 0.721, which is higher than the average of Europe and therefore places Japan in the leaders category (Archibugi et al. 2004, 637). Like the European countries, Japan is counted as developed country (Developed and developing regions n.d.). The literacy rate is high 99% (Literacy 2002) and the amount of years of schooling (from primary to tertiary) is high, 15 years (School life expectancy (primary to tertiary education) 2008). According to CIA's World Factbook, Japan has the 3rd highest energy consumption amount in the world (Country Comparison :: Electricity – Consumption 2011).

When it comes to technology, Japan is well known for technology industry. Japan hosts such companies as Sony, Fuji, Panasonic, Canon, Toshiba, Honda, Toyota, Nintendo and Mitsubishi.

2.3.5 Differences in the Time Perception

When it comes to time perception, sometimes it is difficult to define to which (monochronic or polychronic) time perception a national culture belongs to. Although Hall and Hall (1990, 13) state that "Like oil and water, the two systems do not mix", still Hall and Hall (1987, 18) describe the Japanese culture to combine them.

Figure 12 is an attempt to show how the time perception can flow from monchronic (red) to mixture of mono- and polychronic (purple) to polychronic (blue). Instead of measuring the level of mono- or polochronity of a culture, this presentation attempts to show how there is no "neutral time perception", but instead different amounts of the mixture of the two.

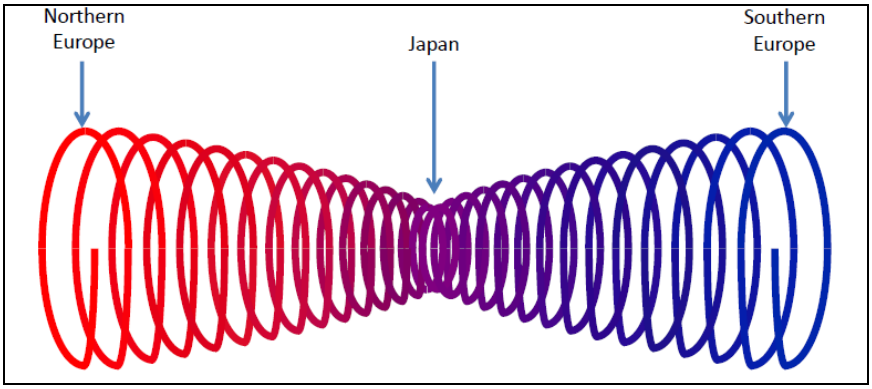

Figure 12. Time perception.

Figure 13 presents the characteristics of monochronic and polychronic people described in Hall et al. (1990, 15). While studying culture's time perception can these characteristics be used to evaluate whether the culture is more mono- or polychronic; or maybe a mixture of the two. It can be that the culture's time perception changes based on what aspect of the life is being examined. A person might be extremely punctual and have well organized schedules for their work (monochronic); but prefer keeping their private life less planned and base their decisions on the personal relationships (polychronic).

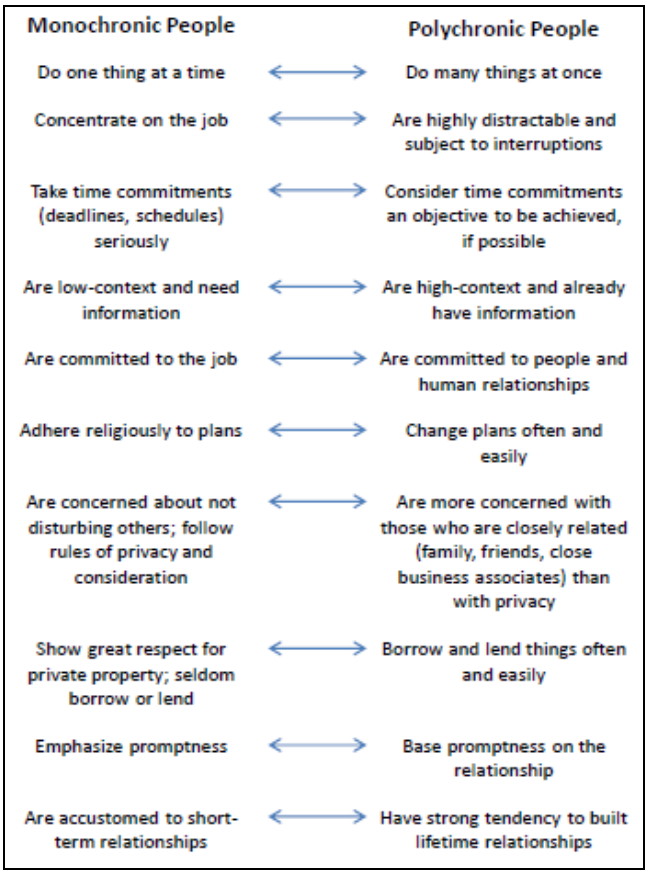

Figure 13. Differences between mono- and polychornic people (extracted from Hall et al. 1990, 15).

Japanese Combination of Mono- and Polychronic Time Perceptions

Hall et al. (1987, 18) explain that while the Japanese are dealing with foreigners and using technology they are more monochronic, but in other aspects (especially interpersonal relations) they have polychronic time perception. Hoft (1996, 54) adds that the Japanese approach to business dealings is monochronic with its inflexible schedules. This combined with the importance of relationship with the clients and customers wraps the Japanese culture to be a mixture of the two (Hoft 1996, 54).

Examples of monochronic tendency in Japanese culture are for example the value on punctuality in business meetings (described in Norbury 2011, 140) and consideration of not disturbing others, which is connected to losing face (described in chapter 2.3.1) in Japan.

In the other hand examples of the polychronic tendencies of Japanese culture are high-context nature of it (see chapter 2.3.1), the commitment to people and therefore basing the promptness on the relationship. Norbury(2011, 140) describes that while doing business in Japan what is important is “who you know” rather than “what you know”.

The Opposites in the Time Perception within Europe

The time perception within different European countries differs quite a bit. Southern European countries are more polychronic with their flexible understanding of time and schedules, whereas Northern European countries are monochronic with their prompt schedules and valuing work over relationships.

While studying in Spain (2010-2011) I experienced the different understandings of time between different nationalities in Europe, when arriving to a scheduled meeting few minutes earlier. The only other ones who had arrived on time were the Germans. The next ones to arrive were the Belgium and French. And finally, usually way pass the scheduled meeting time Spanish, Turks, Romanians and Italians arrived to the meeting point.

Even better known for their promptness than Finns are the Germans. As described in GlobalEDGE website that offers global business knowledge, the Germans do not accept being late from a meeting. Being late would be considered as a huge etiquette mistake and a bad start for business. (GlobalEDGE n.d.)

The same separation between Southern and Northern Europe continues when thinking about the context level of the cultures that is one of the aspects included in the characteristics of time perception (see chapter 2.3.1). Northern countries are low-context whereas Southern European countries are more high-context. The Southern Europeans can also be described to be more oriented and committed to the human relationships, whereas the Northern and Western Europeans are committed to the job. The same goes to privacy: Northern European people usually

value their privacy more, whereas Southern Europeans are more accustomed to sharing things with their closely related family, friends and business associates.

2.3.6 Authority Conception and Power Distance

Baumgartner states that Hoft (n.d.) describes authority conception and power distance dimensions closely related to each other. Hofstede's power distance is more concentrated in the boss-employee relationship as well as the hierarchy in the society and its acceptance; and how it affects the communication between members of the culture. Whereas the authority conception dimension by Condon & Yousef is used to describe the leadership in different cultures. (Baumgartner 2003, 49)

For this thesis work it was decided that power distance provides more valuable information on the case that is being handled. That is why power distance was used to describe the authority conception dimension in the cultural models.

The data to evaluate the power distance of the cultures were collected from the Hofstede Centre's (n.d.) website. Based on the descriptions given for different countries scores a scale (see figure 14) was created to visualize the differences between the cultures.

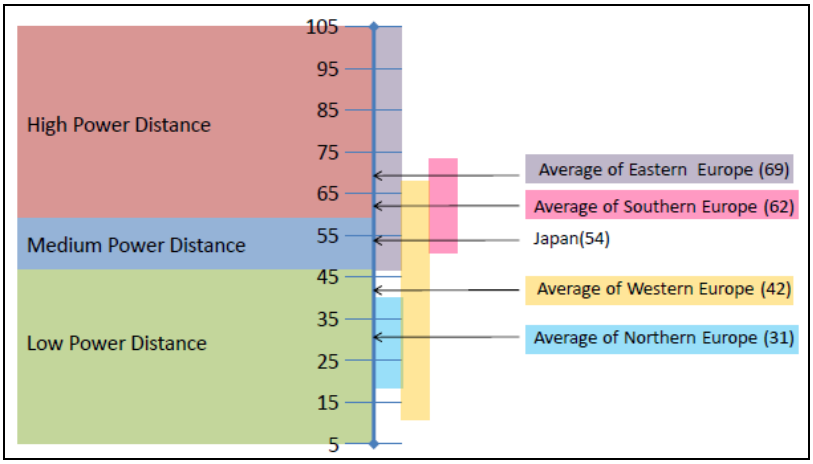

Figure 14. Categories of power distances (based on the Hofstede Centre n.d.).

Medium Power Distance in Japan

Japan is given the score of 54 in the power distance dimension. Japan is described to be mildly hierarchical culture. This is a result of the hierarchical decision making process, where the process goes through all the hierarchical levels before the result is confirmed. This also means that the one on the highest level of hierarchy cannot either make the decisions by himself and thus the complete power is not centralized to one person. Another reason for the higher ranking is the fact that the power is not inherited but gotten by proving one's skills. (The Hofstede Centre n.d.)

Hall et al. compare the hierarchical structure in Japan to the one existing in army. There is a chain of command that needs to be followed, the different hierarchical statuses of people are acknowledged daily and loyalty is important. They also state that the emphasis of the performance is more on the group rather than in individuals, similar to army. (Hall et al. 1987, 42-43)

An aspect of the low power distance is the distribution on knowledge. The high-context communication in Japan requires that all the parties have the same level of knowledge about the topic. Therefore open offices are common, where sharing information is easy. (Hall et al. 1987, 75) Therefore it can be said that even though in multiple aspects Japanese culture has high power distance, it has also qualities that can be described to be characteristics of low power distance.

Manners such as bowing (the depth of the bow depending on the status of the person and the person to whom the bowing is done) and avoiding direct eye contact are used to show the respect to the superiors.

Low and High Power Distance within Europe

To examine the differences in the power distance within Europe, the data of the same 24 countries as examined in the uncertainty avoidance dimension were collected from The Hofstede Centre's (n.d.) website. In the appendix 1 is a collection of these values. A separation between Western, Eastern, Northern and Southern

European countries is done to enable comparison between different regions of Europe. The average value of each region is shown under the group.

Northern and Western European countries are ranked to be low power distance cultures; whereas Southern and Eastern European countries are complete opposite to that with their high rankings. Exceptions in this pattern are Belgium and France that unlike the rest of the Western European countries are ranked to have high power distance.

When looking at the overall level of power distance in Europe (see appendix 1), the average stays quite low (49), placing Europe in the medium level of power distance. When analyzing the scores more (see figure 15) it can be seen that only one of the 24 countries scores tremendously different value from the others (Slovakia with 104). When leaving out this one exception the average lowers to 47 which is close to the boarder of lower power distance score (46). Hence it can be said that although the power distance level differentiate greatly within Europe, can the average be placed between medium and low.

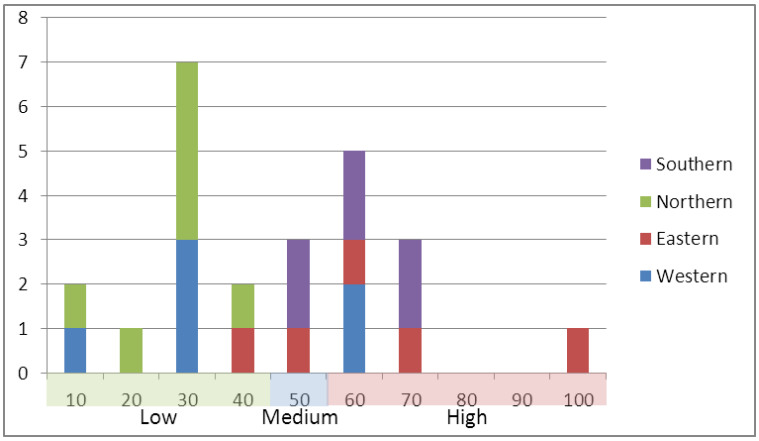

Figure 15. Distribution of scores of different regions of Europe in the categories of power distance.

The higher score in power distance in Southern Europe and Eastern Europe may derive from different reasons. In Southern Europe the older generations are expected to be respected to a great extent and the Catholic Church has power in the

people's lives as well as in the legislation. The history in the Soviet Union in the Eastern Europe may offer an explanation for the high power distance. In these countries there are quite big differences in the equality of people based on their inherited wealth and the level of education. Group consensus is seen as important part of living.

In the Hofstede Centre's website the low power distance cultures are described to be independent, have equal rights, the hierarchy exists for convenience only and the management is there to facilitate and empower. In the case of Germany for example this is described to be shown in the highly decentralized division of power as well as in the communication that is more direct and participative. Similar qualities exist in the other low power distance cultures such as Finland and Sweden. (The Hofstede Centre n.d.)

2.4 Differences and Similarities in the Cultural Models

Based on the six studied dimensions of culture (chapters 2.3.1 – 2.3.6) were models of European and Japanese culture created. In the figure 16 these two models are put together in a diagram to show the differences and similarities. The values that the cultures have on each of the dimensions were converted so that the maximum value here is 100 (outer ring) and minimum 0 (core). The conversion table can be found in the appendix 2. With the time perception dimension only three values were used: 100 for polychronic, 0 for monochronic and 50 for the mixture of the two.

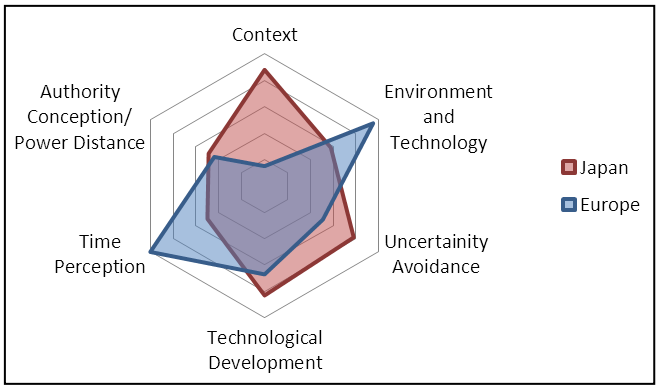

Figure 16. Japanese and European cultural models.

In the following are the descriptions of these differences and similarities on each of the dimensions. By stating the differences in the dimensions the factors that should be examined more carefully are discovered and the less important factors can be left out from the extent of this thesis work. The factors are used as a base for a set of Japan specific cultural heuristics (see chapter 2.4) that can help to recognize the aspects of Japanese user experience that should be considered when designing a product in Europe for Japanese markets.

The Possibilities in the Usage of High Context Elements

In the context dimension of culture the two cultures studied here differ greatly. Japan is high-context culture, whereas European culture is low-context. Although more problems would probably occur if the interface was to be localized from high-context to low-context culture, can high-context be used here to support the user experience of the Japanese users.

Differences in the Perception of Technology

The differences between Japanese and European cultures in the matter of environment and technology are small, but nevertheless existing. Not either one of the cultures feels negatively about the technology, for both it is part of the everyday life. What is different is the experience of technology. For Japanese technology is normal part of the environment, almost ubiquitous, it has become unnoticeable part of the environment; whereas in Europe technology is experienced as controlling factor over the environment and less embedded in the environment. This difference in the perception of technology should be recognized while localizing the user interface.

"Try and See" Is Not an Option

Japan is evaluated here to be high uncertainty avoidance culture. As the uncertainty avoidance level in Europe differs greatly based on the region that is being observed, the average falls in the medium level of uncertainty avoidance. Though, for this thesis work it was seen more feasible to use the value that show the most contrast

with Japanese culture, which was the Northern European culture with its very low level of uncertainty avoidance. Therefore the two cultures can be seen to have great differences in the uncertainty avoidance dimension. As the Japanese avoid situations that are uncertain, it is important to know the results of certain actions beforehand. The European ”learn by mistake” way is not considerable in Japan.

Equally Technologically Advanced Cultures

The two cultures have same level of technological development. They both are considered to be leaders in technological capabilities and therefore are in the advancement end of the scale.

The problems that might exist while localizing a product from the advancement end of the scale to a culture in the backwardness end do not exist here. Therefore, the technological development dimension was evaluated to be irrelevant here and was left out of the extent of the thesis work.

Time Perception for All

In here the time perception value from Northern and Western Europe was used to describe the European time perception, since monochronic culture was seen to create bigger expectations for the user interface design. Using the average of European cultures was not feasible, since South & East and North & West differ greatly in this dimension. The average would have not resembled neither one of them, but a mixture of the two which is not the actual case.

As Japan is described both mono- and polychornic culture, but specified to have more monochronic tendencies in the matters of technology and work, it is treated as monochronic culture here. Therefore the factors that are important for monochronic culture are examined in the user interface. It was evaluated that a person from polychronic culture would not probably have any greater problems of using monochronic user interface, whereas a monochronic person would have great problems while using a polychronic user interface.

Recognizing the Needs of High Power Distance Culture

The average of Europe in power distance is quite similar to Japan's value, they both are in the medium power distance category. However, as Europe has clear separation between North & West (low) and South & East (high); and as the description of medium power distance shares more similarities with high power distance than low, is Europe treated as low power distance culture and Japan as high power distance culture. Hereby the factors important for high power distance culture in user interface should be recognized here.

2.5 Japanese Cultural Heuristics

Detecting the differences in the six cultural dimensions evaluated as the most important ones for user interface design (in Baumgartner 2003) were used to create guidelines about the factors that should be considered when designing a user interface for Japanese markets.

A set of Japanese Cultural Heuristics was created based on the cultural models presented in the chapter 2.3. The cultural heuristics attempt to describe some of the aspects that are important for the Japanese user experience. The Japanese Cultural Heuristics are shown in similar format as Dialog Principles for User Interface Design (DIN-EN-ISO 9241, Part 110) (see appendix 3) that are currently in use at ETAS. The document with the Japanese Cultural Heuristics can be found in the appendix 4. In the following are descriptions of the cultural heuristics and their connection to the cultural models.

2.5.1 High Context Elements (Context)

The usage of high-context elements would further support the usage of the user interface in high-context culture. The usual communication in everyday life for a person in high-context culture happens through collecting information from multiple sources: not only direct communication is used as a base for the decisions, but also the other elements of the context. Such things as body language, impressions and the type of the relationships that the people have create the full meaning that is conveyed through the communication.

When transferred to the user interface design this would mean that information that the user interface provides should not only be direct labeling of objects and commands, but also other aspects should be considered. Such aspects are how the culture perceives colors, shapes and sounds to support the interaction. One culture's perception of a color can tremendously effect on how the message is interpreted. For example the authors own perception of color red would make her pay attention to the thing that is shown on red and look for the reason of this alarm state. However, as shown in Barber and Badre's color-culture chart (see third page of the appendix 4), in China the color red has completely different meaning, it resembles happiness.

2.5.2 Intuitive Ways of Interaction (Environment and Technology)

Japanese culture's perceiving of technology as part of environment could be supported by providing intuitive ways of interaction with the user interface.

Instead of making the user adjust to the technology provided in the user interface, should the user interface provide intuitive ways of interaction with the system, like it would be part of the already existing environment. This could be supported by for example using interaction behaviors that are based on real world (e.g. instead of

scrolling down the manual document, providing a way to “turn the page” in the document like in books). These actions could be prompted by instruction messages, such as “swipe the screen to unlock”, in which case the system would predict which would be the wanted actions.

Other aspect of the intuitive ways of interaction would be to provide a clear structure of the software in which the connections between different components could be easily recognized.

2.5.3 Certainty of Results of One’s Actions (Uncertainty Avoidance)

The high uncertainty avoidance level of Japanese culture creates high requirements for the design of the user interface. The user should be able to recognize the results of his actions before actually conducting them. Ito and Nakakoji (1996, 115) describe that “Japanese users read instruction manuals very carefully before they start using a system” by which they try their best to avoid breakdowns.

Avoiding the uncertainty of the results of the actions can be achieved by limiting the choices, presenting clear metaphors and limiting the amount of data (Marcus & Gould 2001, 19). This would also include the usage of high-context elements, so that the user could have the confirmation of the type of action achieved through multiple sources. Marcus et al. (2001, 19) also suggest using navigation system that provides clear indications of the current location in the system, the next and previous steps. This would help to prevent the user from getting lost in the system.

To avoid the ambiguity, clear labeling should be provided and the actions that become irreversible once they are done should require confirmation from the user before they are being carried out.

The manual is important for the Japanese users as mentioned by Ito et al. (1996, 115). Therefore it is important to provide a wide manual that covers all the aspects of the

system, so that the user can at least inquire more knowledge from there in case he encounters a situation in which he feels uncertain of the actions.

2.5.4 Clear Order and Progress of Tasks (Time Perception)

The monochronic cultures prefer having clear schedules and plans to follow. In the terms of user interface design this aspect should be considered by providing a clear order of the tasks and the possibility to follow the progress. The possibility to follow the progress should include the full status of the system as well as the status of each the smaller task. Meaning that in a case where multiple smaller tasks are required to be done to complete the problem that the system solves should the status to accomplish this be shown, as well as the progress of each smaller task included in this over all task.

This can be achieved by dividing the tasks into smaller subtasks and using linear interaction patterns to complete these tasks. The layout should also give indications of the connections between different components in the system and about the order in which they should be conducted.

2.5.5 Flexibility of the Time Consumption (Time Perception)

The arrangement of the schedules for monochronic cultures base on the time spent, rather than to the completeness of the task(s). Therefore it is important that the system supports the user's freedom to choose when to stop a certain task and be able to continue from the same point later without losing any data.

This could be supported by creating small enough tasks that can be completed quickly, without having to continue later. The system should enable the user to return to the same view as where it was the last time that the user closed the system.

Also enabling the user to see the status of the tasks in the overview of the system would help them to locate what has been done and what still needs to be done.

2.5.6 Hierarchical Structure (Power Distance)

The high power distance of the Japanese culture results in the preference in the usage of hierarchical structures, both in the access to the information as well as in the organizations.

For user interfaces it would be preferable to provide different user levels, which would allow the user the access to different parts of the system based on their hierarchical level. This would also help out to “clean up” the user interface, as only the parts that are relevant to the certain user level would be provided.

As mentioned, also the information should be provided in a meaningful hierarchical order. Only information and tools that are relevant for the current view and status should be provided.

2.6 Objective Dimensions of Japanese Culture

The main focus of the thesis work is in defining the subjective dimensions of Japanese culture in comparison with European culture and how they affect the user experience when localizing a user interface from Europe to Japan. However, it is also feasible to have a look on the objective dimensions of Japanese culture, so that possible mix-ups can be avoided.

Like described before (see chapter 2.1.1), the objective dimensions are visible in the culture and easy to discover. In the following are described few such factors that can be easily discovered while living in Japan and learning about the culture. These

factors can be easily detected and integrated in the localized user interface. Making this small effort already improves the user experience. A checklist created of the objective matters of Japanese can be found in the appendix 6.

2.6.1 Language

It is defined in the CIA's World Factbook that Japanese is the main language of Japan. When having a look in the ethnic groups in Japan are 98.5 % Japanese, 0.5% Koreans and 0.4% Chinese and the rest others. (People and Society :: Japan n.d.) With this it can be stated that the language to be used should be Japanese.

2.6.2 Date and Time Formatting and Calendar

If both, time and date, are presented, date is shown first and time then.

The time is shown in 24-hour clock, presenting the hour on the left side and minutes on the right side. The hours and minutes are separated by colon (:). In a case the hour is only one digit (e.g. 8) no zero (0) is applied in front of the hour (e.g. 8.35).

In the date formats the order is from left to right as follows: year, month and day. The different components of the date may be separated either by dots (.), slashes (/) or with suffix (年 meaning year, 月 meaning month and 日 meaning day). If a day of the week is shown, it is on the right side of the date. See figure 17 for examples of date and time formatting.

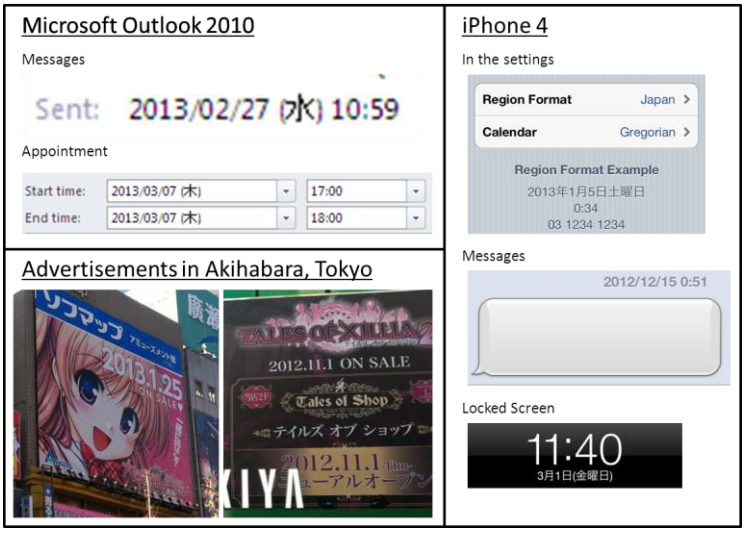

Figure 17. Examples of date and time formatting in Japan (screenshots from Microsoft Outlook 2010 and i Phone 4; pictures taken by Elisa Karpoff).

Although Japan has its own calendar system (based on the current emperor's reign), is Gregorian calendar in general use. In the calendar the week starts from Sunday and ends on Saturday. See figure 18 for examples of Japanese calendars.

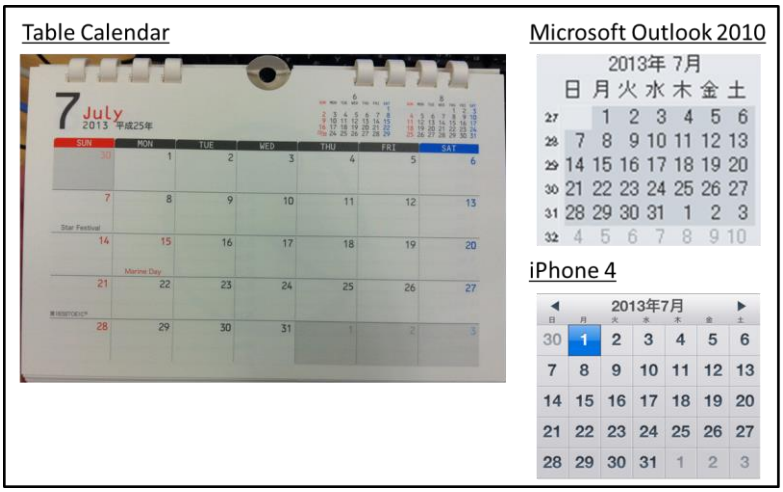

Figure 18. Examples of Japanese calendars (screenshots from Microsoft Outlook 2010 and iPhone 4; picture taken by Elisa Karpoff).

2.6.3 Text Formatting

There are two writing systems in use in Japan (yokogaki and tategaki). While observing the existing websites (see figure 19) and other user interfaces (see figure 20) it can be recognized that yokogaki (from left to right and then top to bottom) is in

greater use. Tategaki (from top to bottom and right to left) is almost never used. However, when having a look in Japanese books it can be easily seen that they are written in tategaki.

Figure 19. Example of Japanese website (Rakuten Ichiban n.d.).

Figure 20. Example of Japanese user interface of a laundry machine (picture taken by Elisa Karpoff).

An assumption can be made that yokogaki is more preferable for the software, but tategaki would be more natural option for the manuals that include large amounts of text.

2.6.4 Number Formatting

Although Japan has its own numerals (see figure 21) are the Arabic Numerals in wide use in the user interfaces.

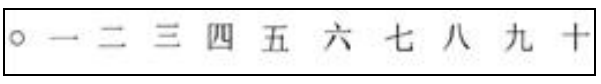

Figure 21. Japanese numerals (Globalization Step-by-Step: Number Formatting n.d.).

When it comes to grouping of the digits, each digit up to ten thousand (10^4) has its own name. From ten thousand on every four digits has a ”special” naming (see appendix 5). In English this grouping of digits happens with every three digits (see appendix_). The values in the between are described with combining two numerals (”jū-man” (10^5), ”hyaku-man” (10^6) and ”sen-man” (10^7)). Hereby it could be assumed that grouping the digits in groups of four (e.g. 1000 0000) would make more sense for the Japanese.

2.6.5 Currency

Japan uses yen as their official currency. Since the smallest coin that can be found is 1 (one) yen, no decimals are needed in the presentation of currency. In international context the symbol of yen (¥) is shown on the left side of the number. However, in Japan the symbol for yen(円) is shown on the right side of the number. The usage of these symbols vary greatly, as ￥ is also in common use in Japan (see figure 22).

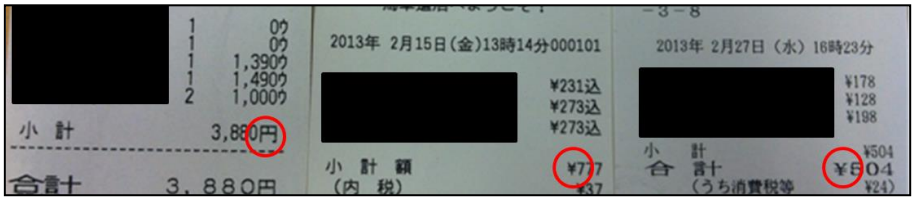

Figure 22. Examples of Japanese receipts (picture taken by Elisa Karpoff).

Three digit groups are used while presenting amounts of money (e.g. 100; 1,000; 10,000 and 100,000) and comma (,) is used as a separator of the digit groups. However, no separators or digit groups are used in the Japanese banknotes.

3 USER INTERFACE INSPECTION

Once the studied aspects of culture's effect on user interface design were defined it was time to move on to the actual user interface that was studied in the thesis work.

The author familiarized herself with the INCA user interface through heuristic evaluation, which also enabled the first check of the cultural usability of it through the Japanese Cultural Heuristics created in the first part of the thesis work. Moreover, it enabled the check of the functionality of the Japanese Cultural Heuristics as a usability evaluation tool in comparison with the Dialog Principles that are currently in use at ETAS.

3.1 Heuristic Evaluation

In heuristic evaluation (HE) individual evaluators study the user interface to discover the usability problems within. These problems are discovered with a help of certain guidelines, recognized as usability principles (or ”heuristics”). Heuristic evaluation described by Nielsen is a systematic inspection of the usability of a user interface. (Nielsen 1993, 155)

Multiple guidelines and principles exist for heuristic evaluation. Some of the most known ones are the ten heuristics of Nielsen (described in Nielsen 1993, 115-155) and the Dialog Principles presented in ISO 9241-110 (see appendix 3). Nielsen (1993, 92) describes the difference between standard and guideline as follows: ”standard specifies how the interface should appear to the user, whereas a set of guidelines provides advice about the usability characteristics of the interface”. Hereby, the guidelines and principles are more general in nature, such as Nielsen's (1993, 129) ”minimize user memory load” –heuristic. They do not give any specific user interface element to which they apply or how they should be presented, but leave it

open for the evaluator to decide how well the heuristic is followed in the user interface.

Since the heuristic evaluation does not include the end users, it should not replace the true user research (Unger & Chandler 2012, 87). However, it enables the initial usability check of the user interface, without having to “waste users”. It should be combined with usability method that includes the actual users, as the findings from these two different usability methods are shown to discover different types of usability problems that supplement each other. (Nielsen 1993, 226)

Nielsen (1993, 156) argues that a single evaluator can find only 35% of the usability problems in an interface with heuristic evaluation and thereby it would be preferable to use multiple evaluators. Figure 23 shows diagrams of usability problems found by heuristic evaluation as a function of the number of evaluators (left) and benefits to costs ratio as a function to number of evaluators (right). The greatest increase in the amount of problems found happens from one (35%) to four (approximately 65%) evaluators. The highest benefit to costs are reached with three (60) to four (62) evaluators.

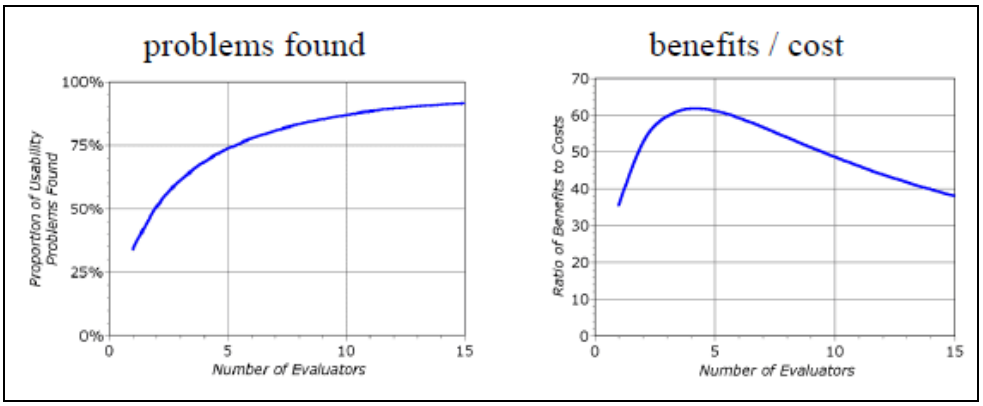

Figure 23. Problems found and benefits of costs as function to number of evaluators in heuristic evaluation (Nielsen 1995).

3.1.1 Phases of Heuristic Evaluation

Unger et al. (2012, 88-89) divide heuristic evaluation into four parts:

1. gathering background information of the object of the evaluation
2. choosing the heuristics to be used in the evaluation
3. conducting the evaluation and gathering information of the problems recognized (observation, description, impact ranking and recommendations) and
4. presenting the findings to the stakeholders.

Siistonen (2012, 35) presents slightly different approach that assumes that more than one evaluator is conducting the heuristic evaluation:

1. providing required information of the product to all evaluators in pre-evaluation training
2. individuals conducting the evaluation with the product and later combining the findings
3. evaluators determine the severity rating of each finding and
4. debriefing with the design team.

3.2 Heuristic Evaluation of INCA V7.0.0

In the thesis work the heuristic evaluation was used to examine the cultural usability of ETAS INCA –software before conducting the user research. It also provided a base to test the functionality of the Japanese Cultural Heuristics (see appendix 4) in comparison to the existing Dialog Principles (see appendix 3).

3.2.1 Phases of the Heuristic Evaluation of INCA V7.0.0

Since the heuristic evaluation done in the thesis work was used together with three other usability evaluation methods (user survey, user interviews and user observation) and the non-validated status of some of the heuristics used (Japanese Cultural Heuristics) was the heuristic evaluation done by a single evaluator (the author). The process was conducted similarly as described by Unger et al. (see previous page).

Gathering Background information of INCA

During her internship at ETAS K.K. the author received a newcomer orientation about the software that are developed at ETAS and where they are used. Also an introduction to electronic control unit (ECU) calibration was given, as well as to the use of INCA in the field.

To recognize what is the startup point of a new Japanese INCA user, the following information was gathered:

- users are commonly mechanical engineers (may not have a lot of information about software development)
- the educational background of the users vary from technical high school graduate to bachelor's or master's degree from university
- previously the new users were trained by the old users within the customer company (sensei style, common in Japan)
- with a new demand ETAS K.K. is providing basic training for new customers (half day training on basic functionalities, calibration concepts, etc.) as well as especially requested trainings that are more thorough (one to two days)
- when a customer buys new INCA –product, they are provided with a CD from which INCA is installed and that has electronic manual that supports multiple languages (e.g. English, German, French, Japanese)

- customer does the installation and required connections to the hardware by themselves (help provided on request). (Sienel 2013b)

The evaluator (the author) received help from a colleague at ETAS K.K. working with INCA to install the software. He also provided the electronic manual that is given to the customers, as well as the training manual used within the company.

The evaluator self-studied INCA through the training and electronic manuals before (and while) conducting the heuristic evaluation. Ito et al. (1996, 115) mention that the Japanese users usually read the manuals really carefully before starting to use the system. This is linked to the high preference on breakdown avoidance (Ito et al. 1996, 115) which corresponds to the high uncertainty avoidance level found while creating the cultural models. Self-study of the manual(s) was evaluated to correspond the Japanese users' way of learning how to use INCA.

Choosing Heuristics to Be Used in the Evaluation

The main focus of the heuristic evaluation was in the Japanese Cultural Heuristics (see appendix 4) that were created based on the cultural models. Since these Cultural Heuristics were created in the course of this thesis work, worked the heuristic evaluation as a way of testing their functionality and allowing the author to further develop them as she noticed the problematic areas while working with them. Using the Dialog Principles (see appendix 3) that are in general use at ETAS offered also a reflection point to the Cultural Heuristics, to see if they offered any additional value compared to the Dialog Principles.

Additionally the objective matters of Japanese culture (see appendix 6) were considered during the heuristic evaluation.

Conducting the Evaluation

The heuristic evaluation and the related tasks (creation of task flow chart) were done with INCA V7.0.0. As the system turned out to be more complex than what the evaluator had expected, required the process more time and one additional task: creation of task flow chart. To limit the extent of the evaluation it was decided to focus on three use cases: setting up and configuring an experiment (1); measuring values (2) and calibrating values (3).

The task flow presented in appendix 7 was followed while conducting the evaluation (excluding the last step: analyzing with MDA). The task flow was created by the author while conducting the evaluation. It was revised and approved later by two experienced colleagues from ETAS.

No actual hardware was used during the heuristic evaluation. The measurement values were simulated to enable the evaluator to go through all of the use cases.

The findings of the evaluation were collected in a Microsoft PowerPoint file (see appendix 8). Figure 24 shows an example of the documentation of a finding. The documentation includes the number of the finding, region of the software where the finding was located, task during which the finding was found, the heuristic to which it was related to, specific description, screenshot, priority rating and suggestions on how the problem could be handled.

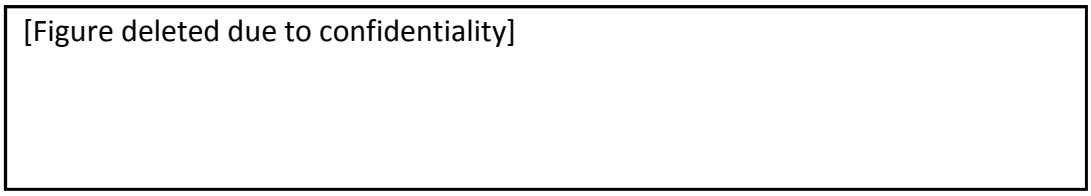

Figure 24.Example of the heuristic evaluation finding's documentation.

Priority Rating of the Findings

The priority ratings of the usability findings were given after conducting the heuristic evaluation.

Nielsen recommends that the severity of the usability findings should not be given only by one usability professional. The rating of the problem by one person is a subjective judgment and therefore cannot be said to be really reliable. (Nielsen 1993, 103)

To determine the severity ratings of the usability problems found in this thesis work, two raters were used. The author provided the heuristic evaluation findings (appendix 8) to a experienced colleague; and both went through the findings and gave their ratings. These ratings were discussed in a meeting, where the final ratings were then determined.

To avoid possible misinterpretations of the results at ETAS, were the severity ratings given in a scale that is in use at ETAS. This scale consists of three levels of severity: 1 – moderate, 2 – serious and 3 – critical. Each of these three different ratings consists of four aspects: frequency of occurrence, impact they have for the user, consistency and the effort that it takes to fix the problem (see table 1). The rating is not necessarily the average of these dimensions, but should be decided case by case. (Severity Rating n.d.)

Table 1. ETAS severity rating scale (Severity Rating n.d.)

	Frequency	Impact	Consistency	Effort
1	Seldom	Bypass	Easy to learn	Low
2	Sometimes	Confusion	Partly learnable	Medium
3	Very often	Breakdown	Not learnable	High

Presenting the Findings to the Stakeholders

Culturally interesting findings of the heuristic evaluation were presented at ETAS together with the rest of the study on the three presentations of the thesis work. The first presentation was given for the Japanese colleagues at ETAS K.K. in the end of May 2013. The second presentation for the colleagues at ETAS GmbH was given in the beginning of June 2013. The final presentation of thesis work was given for the executive board of ETAS on 10th of June 2013.

3.3 Results of Heuristic Evaluation of INCA V7.0.0

16 percent of the heuristic evaluation findings were positive findings. Almost 50 percent of all of the findings were solely related to Dialog Principles and 21 percent to Cultural Heuristics (see figure25).

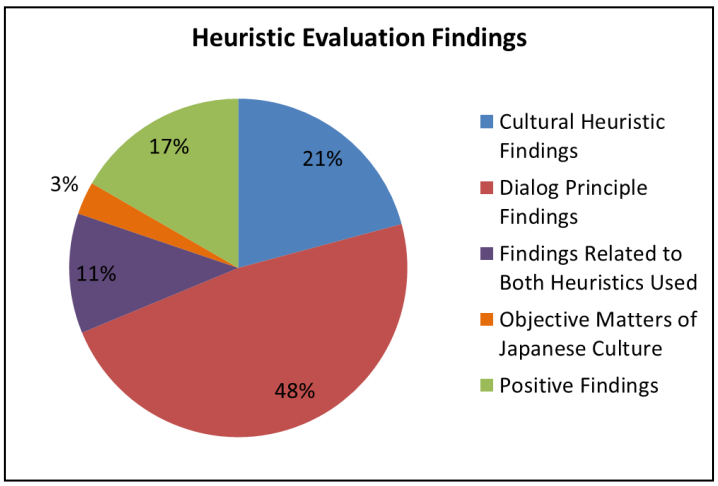

Figure 25. Pie chart of heuristic evaluation findings.

The usage of two separate sets of heuristics offered a chance to recognize the additional benefits (or the lack of them) that the usage of Japanese Cultural Heuristics could provide in recognizing culture specific usability problems through heuristic evaluation. Therefore, additionally to analyzing the heuristic evaluation

findings are the benefits in the usage of the Japanese Cultural Heuristics in comparison to Dialog Principles being evaluated in this chapter.

3.3.1 Heuristic Evaluation Findings

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Figure 26. [Text deleted due to confidentiality]

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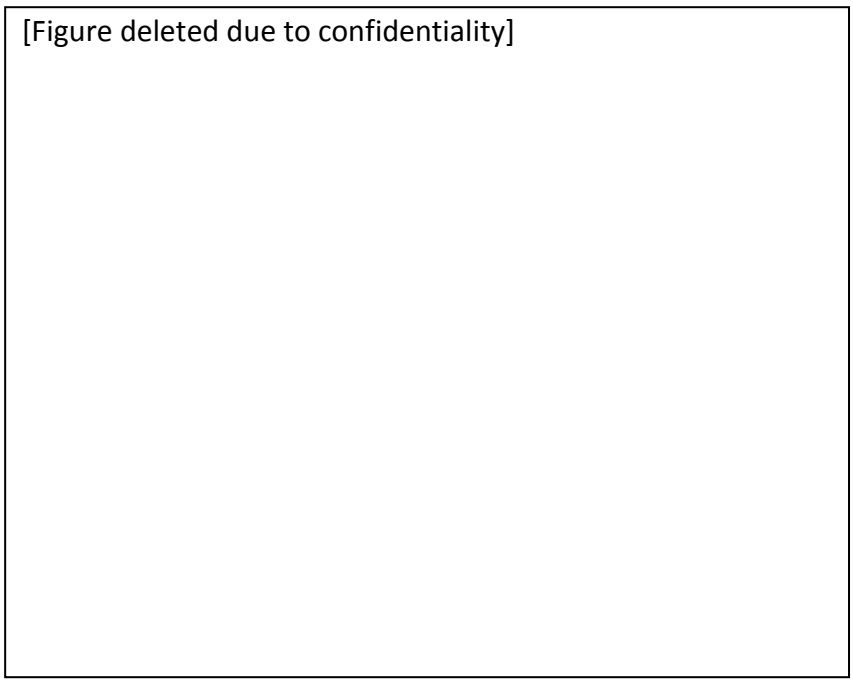

Figure 28. [Text deleted due to confidentiality]

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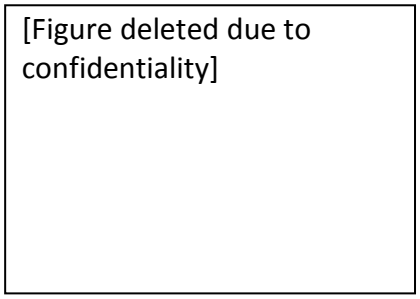

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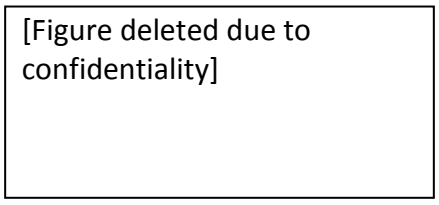

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3.3.2 Cultural Heuristics vs. Dialog Principles

As the Japanese Cultural Heuristics were developed during the thesis work, was the heuristic evaluation of INCA V7.0.0 the first time to see how well they would work in comparison to the Dialog Principles. It also offered a chance for the author to specify the heuristics as she noticed what sort of information was lacking and what topics could be related to each of the heuristics. 25 percent of the found usability problems were solely related to the Japanese Cultural Heuristics, 57 percent were solely related to Dialog Principles and 14 percent could be connected to both of the heuristics (see figure 31). There were also some findings that were about the Objective Matters of Japanese Culture that are usually part of the initial localization process when software is being translated to the local language.

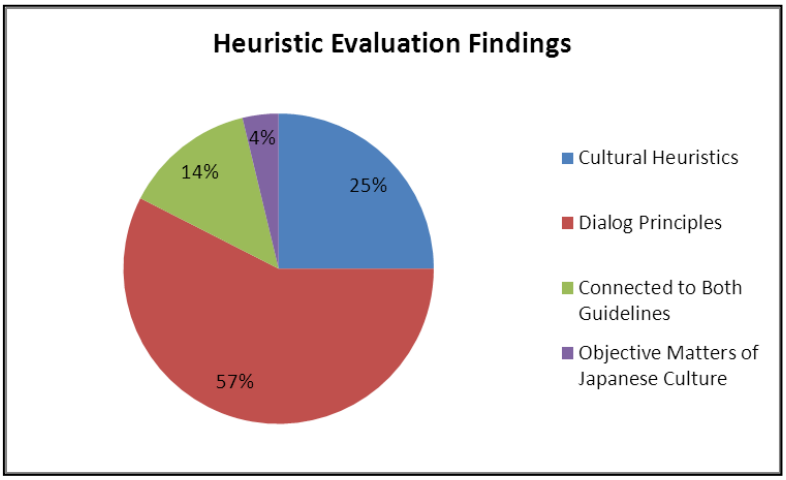

Figure 31. Division of the usability findings from the heuristic evaluation to the different sets of heuristics used.

Similarities in the Heuristics

From the findings that could be connected to both sets of heuristics, the Japanese Cultural Heuristics that had findings that could be connected to Dialog Principles too were:

- High-Context Elements
- Intuitive Ways of Interaction
- Certainty of the Results of One's Actions.

As there still are findings in these heuristics that are not related to the Dialog Principles it is not preferable to make an assumption that usage of these heuristics would not provide any additional benefits for the heuristic evaluation. Especially the High-Context Elements –heuristic would require from the evaluator more cultural knowledge about the Japanese culture in order for her to fully understand and recognize the incompatibilities of the high-context elements within the system.

When it comes to Intuitive Ways of Interaction and Certainty of the Results of One's Actions the similarities to Suitability for Learning, Self-Descriptiveness and Conformity with User Expectations can be recognized easily. These Japanese Cultural Heuristics give more specified description of the matters that are included in the Dialog Principles in more general level. Therefore, they do not provide so much of an additional benefit from the heuristic evaluations point of view, but as guidelines to the developers creating the user interfaces they offer more specific information about the factors that affect the Japanese users' user experience.

Benefits of the Cultural Heuristics

As the Japanese Cultural Heuristics are specified to Japanese culture they provide specific information about the preferences of the Japanese users. From the total of the usability findings 39 percent could be related to Cultural Heuristics, 25 percent were solely related to them. Hereby they create a significant part of the heuristic

evaluation findings and show that there are culture related usability problems in INCA V7.0.0 that may affect the user experience of the Japanese users.

4 USER RESEARCH

The last part of the research done during the thesis work was to get input from the actual Japanese users about their experiences with INCA. Nielsen (1993, 223) describes that the different usability engineering methods are meant to supplement each other, as they are used to learn about different aspects of the usability. As described already in the chapter 3.1, the heuristic evaluation cannot replace the actual user research, since it does not include the actual users.

In this thesis work three different user research methods were applied to collect data about the Japanese INCA users: user survey, user interview and user observation. As each one of them provide different type and equally important data about the users, was the usage of these methods justified.

All the user research methods were executed simultaneously and in the end analyzed together.

4.1 User Survey

As described in Unger et al. (2012, 119): ”you can gain quantitative data from surveys to supplement qualitative data gained from user interviews or contextual inquiry . . . Combining two research methods provides richer picture of the user than one method can provide on its own”.

Doing a survey is a way of getting quantitative information about the users. The questions should be closed-ended, providing the answer options from which to choose from (e.g. ”Yes/”No”, selecting item(s) from list, providing different levels of agreement/disagreement). (Unger et al. 2012, 118-119)

While making a survey the following things should be considered:

- The amount of time that filling the survey takes (should be short)?
- When to start analyzing data (amount of responses got or timeline)?
- How will the data be collected (online, paper) and analyzed?
- What would be the efficient way of distributing the survey?
- To whom is the survey meant for? (Unger et al. 2012, 120)

4.1.1 INCA User Survey

Because of the small amount of the participants to the user interviews and user observations, it was seen as beneficial to collect information from a wider user group through a survey. This way the user research could include wider range of the Japanese users and provide more of an overall picture of the users in Japan.

The goal of the survey was to get response from at least 15 Japanese INCA users to provide quantitative data about the users. The survey was first constructed by the author in English. The first version was distributed to four fellow Japanese ETAS K.K. employees that are working with INCA. Based on their feedback the survey was slightly modified to better fit the Japanese customers.

The survey was translated to Japanese by two Japanese colleagues at ETAS K.K. The surveys were distributed to the users by colleagues at ETAS K.K. Both paper and electronic survey forms were created, but in the end the electronic form was evaluated (by the customer contacts) to be preferred by the users. The paper survey (see English paper survey in appendix 9) was constructed using Microsoft Word 2010. For the electronic survey (see Japanese electronic survey in appendix 10) fillable form was created using Adobe Acrobat Standard 9.3.

Structure of the INCA User Survey

The structure of the INCA user survey was kept short and clear, so that filling it would not take too much time and effort from the users. The survey was build based on the interview and observation guidelines and had the following structure:

1. introduction (describing the purposes of the survey)
2. participants background information
3. current work
4. working with INCA
5. difficulties with INCA
6. specific questions about INCA
7. usability activities at ETAS.

In total the survey includes 22 questions which are mostly questions with options for answers. The usage of questions with existing answering options was seen as feasible to enable the participant quickly fill in the answers and to keep the translation work in minimum. Five open questions are included and some of the other questions include also a possibility for the participant to clarify their answers in writing.

INCA User Survey's Connections to the Japanese Cultural Heuristics

Besides collecting information about the Japanese INCA users for ETAS, one of the other reasons for the survey was to try to validate/invalidate the Japanese Cultural Heuristics. In the appendix 11 are explained how the survey questions are connected to the Cultural Heuristics. The questions under headline of ”Background Information” are left out of this description, since they provide basic information about the user, not specially linked to any of the heuristics. Also the last part about ”Usability Activities at ETAS” is left out, since it is used to collect information about the interest regarding the topic.

Responses to the INCA User Survey

The responses to the survey from the users were collected by the customer contacts, who forwarded the responses to the author for further analysis. All together 26 responses were collected from the users from three different companies (see figure 32). Required translations to the open questions from Japanese to English were done by two colleagues at ETAS K.K.

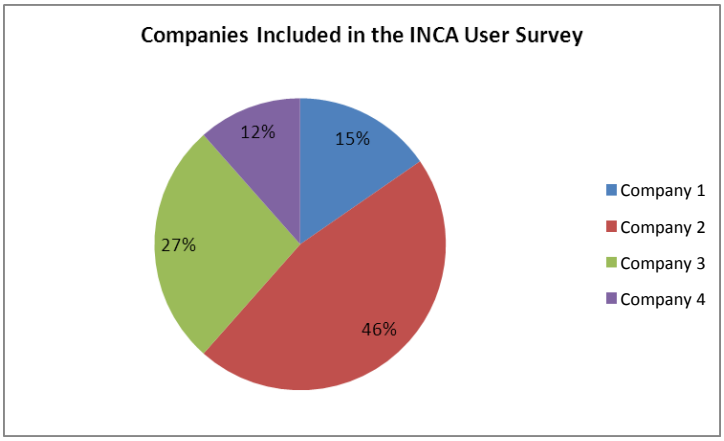

Figure 32. Companies included in the user survey.

The answers to the surveys were collected to Microsoft Excel table for further analysis (see appendix 12).

4.2 User Interviews

Unger et al. describe user interviews as ”structured conversations” with the users. During the interviews the interviewer discusses through a pre-structured list of topics with the interviewee regarding the topics interesting to the product being studied, like the goals that the users have for using the product and the next tasks after completing these goals. (Unger et al. 2012, 111- 112)

4.2.1 Goals of the INCA User Interview

The goal for the user interviews with INCA users was to get at least two to three face-to-face interviews on-site. Because of the authors insufficient Japanese language skills, were the interviews planned to be conducted by Japanese colleagues from ETAS K.K. who were supposed to work as the interviewers during the interviews; and to collect and translate the answers from the participants.

The goal for the results of the interview was to collect qualitative data from the Japanese INCA users about their thoughts regarding their work and INCA.

4.2.2 Guidelines to the INCA User Interviews

Since the interviewers that were planned to be used in the user interviews were not usability professionals, nor did they have experience about similar activities, it was important to create thorough guidelines that would instruct them on conducting the interviews.

The author created User Interview Guideline (see appendix 13) that included instructions to the interviewers about the practice and about things to focus on, as well as the script for the interview.

The questions of the interview include both open- and closed-questions. To help the interviewer fill in the answers were some answering options provided from which the interviewer could select the participants answer quickly. The space for the open-question answers were also provided within the guidelines.

Besides the guidelines, the author gave a short presentation about the user interview as a user research method to the colleague participating in the user interviews. During this presentation the author explained about the purposes and style of the user interview, as well as about the things that the interviewer should focus on

during the interviews (see appendix 14 for the presentation (combined with user observation presentation)). The author also did a test interview with the Japanese colleague participating in the actual interviews, so that the problem points of the interview guidelines could be recognized and that the colleague could have a feel about what could be expected from the interview.

Structure of the User Interview Guidelines

The questions in the INCA user interview were concerning similar topics as the INCA user survey. The guidelines had the following structure:

- Instructions for the interviewer
- Instructions for filling the answers
- Pre-interview information (from interviewer)

1. Welcome
2. Interview
   - 1.1 Initial Interview
   - 1.2 Current Work
   - 1.3 Environment of Use
   - 1.4 Questions about INCA
   - 1.5 Concluding Interview

- Post-Interview Information (from Interviewer)

A declaration of consent form was also created. It turned out that requesting a signature in this type of document in Japan would cause a lot of the bureaucracy issues, since the employees would need to have the permission to sign such a document from the higher board of the company. Based on the discussion with the participants was the need for such document evaluated to be less important.

4.2.3 Conducting the INCA User Interviews

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Figure 33. [Text deleted due to confidentiality]

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4.3 User Observation

During the user observation, the observer follows the users normal work tasks with the product. By doing this the observer gathers information about the user's usual tasks and usability of the system. (Nielsen 1993, 207)

Unger et al. provide two approaches to observation: *active observation* and *passive observation.* During *active observation* the user acts as a master of the system and teaches the apprentice (observer) about the usual tasks. This approach provides important information about the reasons of the users behavior, as the user explains the apprentice about the usage of the system. This allows the observer to ask the user about the reasons behind certain behaviors in more natural way. Whereas *passive observation* has the observer quietly observe the usual behavior of the user, as if the observer was not there. Possible questions should be noted down and asked in the end of the session. (Unger et al. 2012, 115)

As the observer may be from the development group of the system that is being studied may the user be tempted to ask questions from him regarding the system during the observation. However, the user should be advised to leave these questions in the end of the session, once the observation is finished. This way it is possible to first collect information about the ways in which the user currently uses

the system and then the questions can provide more information about the topics that the user would like to do. It can also serve as a way to reward the user for taking part in the study. (Nielsen 1993, 208)

4.3.1 Goals of the INCA User Observations

The goal of the INCA user observation was to gain empirical knowledge about the users' tasks and their working environments. With this empirical knowledge the author could gain more detailed view about the factors that affect the users' work, as well as the ways in which they actually use INCA.

The initial goal was set to have two to three user interviews and observations in the users' actual working environments that were planned to be conducted as contextual inquiry (combining the user interview with user observation). But as there turned out to be difficulties in observing the users in their work (the strict confidentiality requirements of the customer companies in the automotive) was the contextual inquiry changed to traditional interviews and user observations. As there were also difficulties also in scheduling the visits, was the goal set to have two half day passive observations (not requiring input from the participant) with two different user level users (novice and expert).

4.3.2 Guidelines to the INCA User Observations

Like with the user interviews, it was known that the Japanese colleague(s) that would be participating in the user observation did not have any previous experience in the field of usability engineering, nor had they taken part in similar activities before. Therefore it was important to create a user observation guideline (see appendix 16) which would instruct them in conducting the user observation and guarantee the quality of the findings collected from the observation.

The method and style of the user observation was also explained in a presentation given to the Japanese colleague prior the visit to the customer site (see appendix 14).

Structure of the Observation Guidelines

The observation guidelines include the following topics:

- Pre-observation information (from observer)

1. Explanation of the purposes and structure of the observation to user

- Instructions for the observer
- Space for observation notes

2. After observation discussion & possible questions

- Post-Interview Information (from Interviewer)

As the space provided in the guidelines for the observations is only one page, was the observer instructed to take some additional papers or notebook to which he could write his observations.

4.3.3 Conducting the INCA User Observations

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4.3.4 Analyzing the Results of the INCA User Observation

The observation notes of the two observers (author and the colleague from ETAS K.K.) were combined in a one day workshop done after the observations. The workshop followed the structure for creating an affinity diagram presented at the ETAS Usability Wiki that is derived from Holtzblatt, Wendell & Wood (2004):

1. observers going through their notes and writing them down on cards
2. mixing the notes on big surface so that everybody can read the notes
3. participants reading the notes in silence
4. participants creating clusters of notes related to each other
5. discussing together about created clusters
6. labeling the groups. (General User Research Issues n.d.)

The actual process would include further steps (such as giving the clusters different priority ratings) that were not conducted during this workshop, because of the limitations of time and their irrelevance for the thesis work.

In total 13 groups were defined (see figure 34) and later on documented in Microsoft PowerPoint (see appendix 17) for further purposes. The workshop was not aimed to analyze the observation notes from the cultural aspect, but to compile the observation notes from the two observers. The further analysis of the cultural matters was done later by the author together with the other user research results (see chapter 4.4).

Figure 29. Affinity diagram of the user observation notes.

As the two observers had completely different backgrounds (the colleague focused on software testing and the author in user interface design) it was interesting to notice how different kinds of issues each one of the observers had noted down. It was obvious that this sort of combination of the observers provided far wider view of aspects noticed during the observation than using observers with similar backgrounds would have.

4.4 Analysis of the Results of the User Research

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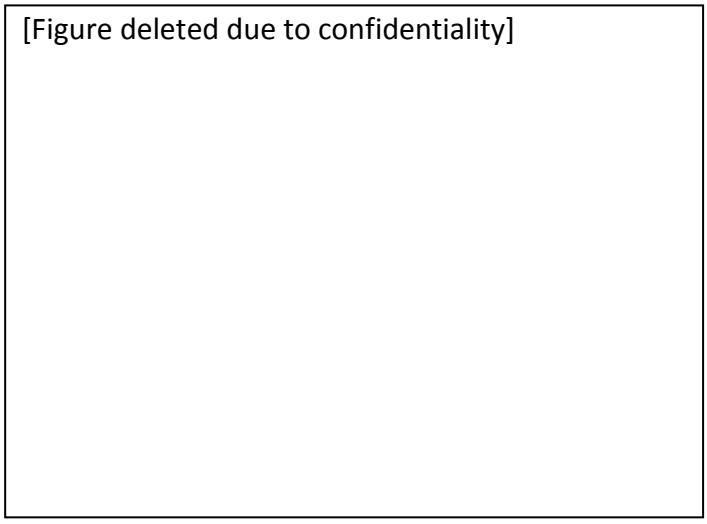

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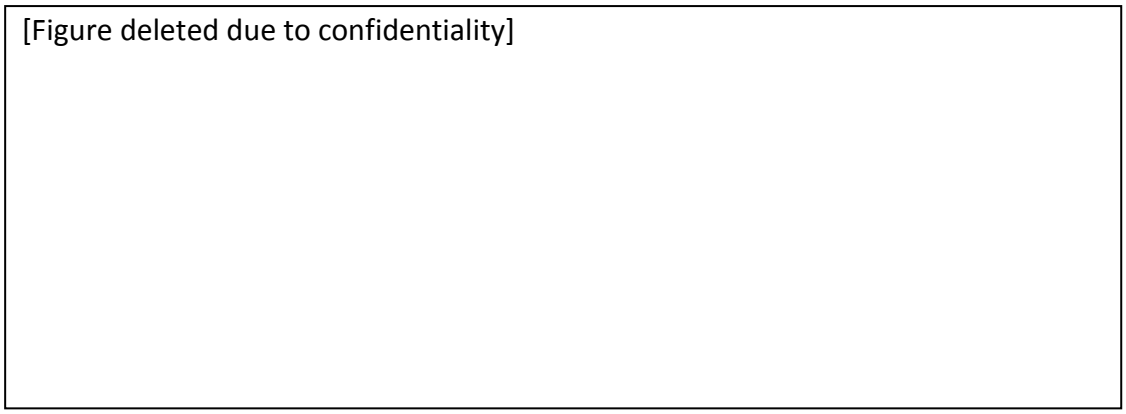
Figure 36. [Text deleted due to confidentiality]



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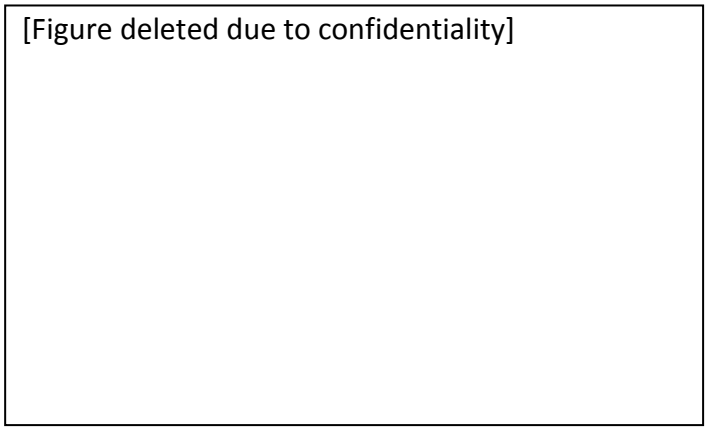

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5 CONCLUSIONS

As the thesis progressed the effects of culture to the user experience became more and more obvious. Culture affects the way in which we perceive the world and therefore how the users experience a product.

The focus of the thesis was especially in the cultural usability of the user interfaces and the differences in it between Japan and Europe. As the user research was solely done in Japan and the author did not have previous knowledge about the European INCA users, are the conclusions of the cultural usability of INCA solely made by reflecting the findings to the Japanese Cultural Heuristics created during the thesis work. To provide more accurate knowledge about the differences between the Japanese and European INCA users, it would be beneficial to conduct similar user research with European users, so that actual comparisons could be made.

The complexity of conducting a cultural study became obvious from the very beginning of the thesis work, as mentioned before already the term “culture” can be defined in several of different ways, as well as its structure. Multiple theories exist, but no “ultimate truth” can be defined. The same can be said about the study of a specific culture: the existing researches basis highly on empirical research and the perception of an anthropologist or an ethnographer; therefore it is never completely objective.

The cultural models were created based on a literature research as well as to the author’s empirical knowledge about different cultures. This brings already two different subjective sources of knowledge to the study: the author and the writers of the used literature. As the author is neither anthropologist nor ethnographer, she was learning how to do a cultural study as the thesis progressed.

To provide more accurate and more reliable definitions of the cultural dimensions, would deeper cultural analysis needed to be done through literature (as well as empirical) research in both of the cultures. The definitions provided in the thesis work were highly relying in the existing research.

5.1 Which Culture?

Definition given in the chapter 2.1 by Hoft is that culture is learned behavior that includes thoughts, feelings and actions. When studying as professional tool as ETAS INCA, not only should the national culture be considered, but also the professional culture. The users are not only affected by the national environment in which they have grown and lived in, but also the professional and company culture in which they are in. This was noticed during the user research, as the differences between the expert and the novice user were noticed, as well as the strong influence that the company culture had in their behavior.

The Japanese Cultural Heuristics were created based on the assumption of having a product that is localized from one nation to another, without considering the field in which the product is located in (leisure time, professional, hobby). For the purposes of studying a professional tool like INCA, it might have been more beneficial to select different dimensions of culture which would have provided more knowledge about the working culture of different nations. Such would have been for example the collectivism versus individualism -dimension described by Hofstede (see Hoft 1996, 59).

5.2 Usability of the Japanese Cultural Heuristics

Already during the heuristic evaluation of INCA it turned out that studying the High-Context Elements –heuristic is complicated. It would be more beneficial that a person from the target culture would do the evaluation, since learning about all the preferences and values related to the High-Context Elements would be extremely time consuming. Other heuristics were experienced to be easier to understand and study.

Some overlaps between the Japanese Cultural Heuristics and the Dialog Principles exist (see figure 31), which might suggest that the benefits in using the Japanese Cultural Heuristics might not be so high. However, the 25% of the usability findings that were solely related to the Japanese Cultural Heuristics would suggest that some additional benefit can be gained from using them.

5.3 Cultural Model for Everybody

Ford and Kotzé studied Hofstede's cultural dimensions (from which here studied the power distance and uncertainty avoidance) to learn about the benefits of adapting the user interface to the user's cultural dimensions. They found that rather than providing a user interface adapted to the user's cultural model, would the usage of certain cultural model provide benefits to all users. This model would consist of high power distance, high uncertainty avoidance, masculinity and collectivism. (Ford et al. 2005, 8 &12)

As the set of cultural dimensions that were studied here differed a bit from the ones used in Ford's and Kotzé's study, were some additional observations made. The usage of the Japanese Cultural Heuristics would not only be beneficial for the Japanese users, but most likely for the other users too. They might not be necessary

for the other cultures, but surely having the certainty for the results (high uncertainty avoidance) that follow the users actions would be good for other users too, as well as seeing clearly the progress and order of tasks (monochronic time perception) or being able to leave a task in the middle and being able to catch up with it the next time (monochronic time perception).

However, two of the dimensions that were studied here could be seen as more culture sensitive: environment & technology and technological development. These concern the culture's perceiving of the technology, which may majorly affect the usage of the product in the target culture. When comparing the two cultures studied here (Japan and Europe) the differences in these dimensions are not as critical as they could be, when for example localizing from Japan or Europe to one of the developing countries for example in Africa.

5.4 Need for Localized User Interface of INCA for the Japanese Users?

Currently The Dialog Principles for User Interface Design are in use at ETAS to provide information about the usability factors that should be considered while creating a user interface design. Additionally to them the set of cultural heuristics could be used, not only for localizing the user interface to Japan, but to recognize some factors that are important for certain cultures and that are also useful for other cultures.

In both, the heuristic evaluation and the user research, it became obvious that before focusing on the cultural usability factors of INCA, should the focus first be in recognizing the general usability problems that are important for all. From all of the usability findings in heuristic evaluation 59% consisted of findings related to Dialog Principles. Most of the responses and findings from the user research were also

evaluated to be non-cultural and therefore not analyzed in the course of the thesis work.

5.5 Benefits for ETAS

The thesis work provided ETAS a wide view of the Japanese INCA users, as no such previous studies had been conducted before. The data collected from the total of 30 INCA users involved in the user research provide an excellent base knowledge about the Japanese users and their usual tasks and preferences for further use in the company. The data utilized in the thesis work was only a small amount of the complete data collected (as the rest of the data was not evaluated to be culture sensitive).

Moreover, all the usability findings from the heuristic evaluation have been described and prioritized, which provides a wide amount of identified usability problems to start work on.

Identifying that most of the found usability problems were not connected to the cultural aspects also shows that instead of focusing on the culture specific usability issues should the first focus be in improving the general usability of INCA. Improving the general usability would be beneficial for all of the users around the world and these aspects were the ones that came out the strongest also in the research with the Japanese users.

5.6 Suggested Follow up Studies

Study of the European INCA Users

The user research for the thesis work was only done in Japan. To enable more thorough conclusions of the usefulness of the cultural heuristics in the case of ETAS, would it require a follow up research to be conducted of the European users to see the actual differences.

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APPENDICES

Appendix 1. Uncertainty Avoidance and Power Distance scores (extracted from the Hofstede Centre (n.d.))

	Score of Uncerainty Avoidance	Level of Uncertainty Avoidance	Score of Power Distance	Level of Power Distance	Part of Europe
Austria	70	Medium	11	Low	Western
Belgium	94	High	65	High	Western
France	86	High	68	High	Western
Germany	65	Medium	35	Low	Western
Netherlands	53	Medium	38	Low	Western
Switzerland	58	Medium	34	Low	Western
Average	**71**	**Medium**	**41.83**	**Low**	**Western**
Bulgaria	85	High	70	High	Eastern
Czech Republic	74	Medium	57	Medium	Eastern
Hungary	82	High	46	Low	Eastern
Poland	93	High	68	High	Eastern
Slovakia	51	Medium	104	High	Eastern
Average	**77**	**Medium**	**69**	**High**	**Eastern**
Denmark	23	Low	18	Low	Northern
Estonia	60	Medium	40	Low	Northern
Finland	59	Medium	33	Low	Northern
Ireland	35	Low	28	Low	Northern
Norway	50	Medium	31	Low	Northern
Sweden	29	Low	31	Low	Northern
United Kingdom	35	Low	35	Low	Northern
Average	**41.57**	**Low**	**30.86**	**Low**	**Northern**
Croatia	80	High	73	High	Southern
Greece	112	High	60	Medium	Southern
Italy	75	Medium	50	Medium	Southern
Portugal	104	High	63	High	Southern
Slovenia	88	High	71	High	Southern
Spain	86	High	57	Medium	Southern
Average	**90.83**	**High**	**62.33**	**High**	**Southern**
Average of all	68.63	Medium	49.42	Medium	

Appendix 2. Conversion table for cultural dimension values

	Japan					
	Europe					
	Context	Environment and Technology	Uncertainty Avoidance	Technological Development (ArCo Index)	Time Perception	Authority Conception /Power Distance
	High Context	Control-oriented	High	Advancement/ Leaders	Polychronic	High
100	100	100	112	0.867	100	105
99	99	99	111.11	0.85861		104
98	98	98	110.22	0.85022		103
97	97	97	109.33	0.84183		102
96	96	96	108.44	0.83344		101
95	95	95	107.55	0.82505		100
94	94	94	106.66	0.81666		99
93	93	93	105.77	0.80827		98
92	92	92	104.88	0.79988		97
91	91	91	103.99	0.79149		96
90	90	90	103.1	0.7831		95
89	89	89	102.21	0.77471		94
88	88	88	101.32	0.76632		93
87	87	87	100.43	0.75793		92
86	86	86	99.54	0.74954		91
85	85	85	98.65	0.74115		90
84	84	84	97.76	0.73276		89
83	83	83	96.87	0.72437		88
82	82	82	95.98	0.71598		87
81	81	81	95.09	0.70759		86
80	80	80	94.2	0.6992		85
79	79	79	93.31	0.69081		84
78	78	78	92.42	0.68242		83
77	77	77	91.53	0.67403		82
76	76	76	90.64	0.66564		81
75	75	75	89.75	0.65725		80
74	74	74	88.86	0.64886		79
73	73	73	87.97	0.64047		78
72	72	72	87.08	0.63208		77
71	71	71	86.19	0.62369		76
70	70	70	85.3	0.6153		75
69	69	69	84.41	0.60691		74
68	68	68	83.52	0.59852		73
67	67	67	82.63	0.59013		72
66	66	66	81.74	0.58174		71
65	65	65	80.85	0.57335		70
64	64	64	79.96	0.56496		69
63	63	63	79.07	0.55657		68
62	62	62	78.18	0.54818		67
61	61	61	77.29	0.53979		66
60	60	60	76.4	0.5314		65
59	59	59	75.51	0.52301		64
58	58	58	74.62	0.51462		63
57	57	57	73.73	0.50623		62

56	56	56	72.84	0.49784		61
55	55	55	71.95	0.48945		60
54	54	54	71.06	0.48106		59
53	53	53	70.17	0.47267		58
52	52	52	69.28	0.46428		57
51	51	51	68.39	0.45589		56
50	50	50	67.5	0.4475	50	55
49	49	49	66.61	0.43911		54
48	48	48	65.72	0.43072		53
47	47	47	64.83	0.42233		52
46	46	46	63.94	0.41394		51
45	45	45	63.05	0.40555		50
44	44	44	62.16	0.39716		49
43	43	43	61.27	0.38877		48
42	42	42	60.38	0.38038		47
41	41	41	59.49	0.37199		46
40	40	40	58.6	0.3636		45
39	39	39	57.71	0.35521		44
38	38	38	56.82	0.34682		43
37	37	37	55.93	0.33843		42
36	36	36	55.04	0.33004		41
35	35	35	54.15	0.32165		40
34	34	34	53.26	0.31326		39
33	33	33	52.37	0.30487		38
32	32	32	51.48	0.29648		37
31	31	31	50.59	0.28809		36
30	30	30	49.7	0.2797		35
29	29	29	48.81	0.27131		34
28	28	28	47.92	0.26292		33
27	27	27	47.03	0.25453		32
26	26	26	46.14	0.24614		31
25	25	25	45.25	0.23775		30
24	24	24	44.36	0.22936		29
23	23	23	43.47	0.22097		28
22	22	22	42.58	0.21258		27
21	21	21	41.69	0.20419		26
20	20	20	40.8	0.1958		25
19	19	19	39.91	0.18741		24
18	18	18	39.02	0.17902		23
17	17	17	38.13	0.17063		22
16	16	16	37.24	0.16224		21
15	15	15	36.35	0.15385		20
14	14	14	35.46	0.14546		19
13	13	13	34.57	0.13707		18
12	12	12	33.68	0.12868		17
11	11	11	32.79	0.12029		16
10	10	10	31.9	0.1119		15
9	9	9	31.01	0.10351		14
8	8	8	30.12	0.09512		13
7	7	7	29.23	0.08673		12
6	6	6	28.34	0.07834		11
5	5	5	27.45	0.06995		10
4	4	4	26.56	0.06156		9
3	3	3	25.67	0.05317		8
2	2	2	24.78	0.04478		7
1	1	1	23.89	0.03639		6
0	0	0	23	0.028	0	5
	Low Context	**Subjugation-oriented**	**Low**	**Backwardness /Marginalized**	**Monochronic**	**Low**

Appendix 3. Dialog Principles (Dialog Principles for User Interface Design (DIN-EN-ISO 9241, Part 110) 2006)

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Dialog Principles for User Interface Design (DIN-EN-ISO 9241, Part 110)

Suitability for the Task

"A dialogue is suitable for a task when it supports the user in the effective and efficient completion of the task."

The software should be oriented after the steps the user needs to take to complete the task. Relations between the steps of a specific task should be clear. Functions and data structures should be labeled with task related terms.

Suitability for the task can be supported by:

- providing only information related to the task,
- automated sequences of actions, provided that it is reasonable,
- considering the user's skills and abilities,
- offering input and output appropriate to the task,
- supporting recurrent tasks with for example shortcuts,
- using meaningful default values and presettings,
- not adding any unnecessary work steps.

Self-Descriptiveness

"A dialogue is self-descriptive when each dialogue step is immediately comprehensible through feedback from the system or is explained to the user on request."

Speak the user's language: labels, icons etc. should be understandble for the user. Furthermore the user should be able to constantly see the current system status and all actions that are currently being performed. The user should always be informed about his current navigation options.

Self-descriptiveness can be supported by:

- offering feedback after every action, provided that it is reasonable,
- offering information and confirmation messages for the user if serious consequences are possible,
- showing feedback and information appropriate to the user's skills and abilities,
- showing feedback and information appropriate to the situation in order to minimize the use of manuals,
- offering immediate feedback about changes in state,
- giving clear information about input formats,
- using understandable and constructive messages.

1

Created: 2011-11

Controllability

"A dialogue is controllable when the user is able to initiate and control the direction and pace of the interaction until the point at which the goal has been met."

The user should have the feeling to be in control of the application. This includes always having the opportunity to cancel the current action and always being able to skip steps that are not needed.

Controllability can be supported by:

- letting the user decide the working speed,
- letting the user decide where to continue working after an interruption,
- offering an undo function (preferrably for more than just the last step),
- giving opportunities for occasional as well as expert users,
- enabling the user to choose desired view and amount of displayed data,
- enabling the use of different input and output devices, especially supporting both mouse and keyboard interaction.

Conformity with User Expectations

"A dialogue conforms with user expectations when it is consistent and corresponds to the user characteristics, such as task knowledge, education and experience, and to commonly accepted conventions."

The basic principle to meet the user expectations is consistency. There should be as few surprises for the user as possible. If this principle is violated, the user's routine will get lost and errors will occur more frequently.

There are four different types of consistency:

- consistency within the application itself, e.g. similar wording / masks / system reactions for similar tasks,
- consistency with other applications and existing standards, e.g. MS Windows User Experience, Java Look and Feel,
- consistency with the tasks,
- consistency with the sociocultural environment, e.g. turning up clockwise, red color for warning and danger.

Conformity with user expectations can be supported by:

- placing all alerts at the same position,
- providing the same actions with the same names and keyboard commands,
- using similar sequences of action for similar actions, e.g. direct manipulation (drag and drop),
- immediate feedback appropriate to the user's skills and abilities,
- positioning the cursor where the next user input is expected,
- informing the user when response time differs significantly from the usual working time.

Error Tolerance

"A dialogue is error-tolerant if, despite evident errors in input, the intended result may be achieved with either no or minimal corrective action by the user."

Errors are not problematic, but their consequences are. Making and dealing with errors is a fundamental way of learning (trial and error). The negative consequences of errors should be as small as possible. In order to support the user, error messages should be constructive, concise and understandable. Automatic error correction should be used when possible. Actions with large consequences have to be confirmed by the user.

Error tolerance can be supported by:

- helping the user to detect and avoid errors,
- preventing undefinded system statuses and crashes caused by user input,
- explaning errors and giving clear correction options,
- supporting error detection and correction by the user,
- offering automatic error correction with an overwriting option,
- letting the user control the error correction,
- always offer the possibility to undo actions that had unwanted effects,
- validation and confirmation.

Suitability for Individualization

"A dialogue is capable of individualization when the interface software can be modified to suit the task needs, individual references and skills of the user."

Individualization is necessary because the way users perform a task varies a lot. All users are different concerning their experience, motivation, color vision etc. The users also change over time: daily condition, experience, etc. Novices have other demands than experts, they need strong user guidance and support, whereas experts need shortcuts and possibilities for individualization. Tasks also vary depending on for example pressure of time, interruption or the social context.

Suitability for individualization can be supported by:

- enabling individual user settings concerning
  - language,
  - cultural peculiarities,
  - individual knowledge and experience,
  - perception,
  - sensorimotor and mental abilities,
- providing different output formats and views,
- providing customization of explanations, e.g. short tips or detailed description,
- enabling individual labeling of objects and actions,
- providing customization of keyboard configurations, menu sorting, toolbars and macros,
- providing customization of application layout.

Suitability for Learning

"A dialogue is suitable for learning when it supports and guides the user in learning to use the system."

This principle is overlapping with the other dialog principles. Suitability for learning is a consequence of usable software. In addition to the previously mentioned features, manuals and user help are important: they should be clear and concise and contain quick guides and examples from everyday working life.

Suitability for learning can be supported by:

- displaying keyboard commands (accelerators, mnemonics, function buttons),
- progressive disclosure,
- enabling the user to play through tasks (learning by doing),
- offering keyboard commands for frequently used functions, instructions and explanation for other functions,
- placing all alerts at the same position,
- using a similar representation of comparable objects,
- providing multi-level help.

Appendix 4. Japanese Cultural Heuristics

Japanese Cultural Heuristics

High-Context Elements

"User interface should provide additional information to the user through high-context elements to support the interaction"

Users from high-context cultures are accustomed to collect information from multiple sources while communicating with others to assure the complete understanding of the matter. Therefore, for high-context cultures it would be preferable to provide multiple indirect ways of presenting parts of the complete information, so that they can fully understand the meaning. Ito and Nakakoji (1996, 112) describe a Japanese saying: "one needs to understand ten by listening to one", which presents the heart of the high-contexity of Japanese culture.

Usage of high-context elements can be supported by:

- using culture's perceiving of colors to support the meaning (see attachment for collection of some colors' meanings in different cultures as presented in Barber and Badre 1998).
- using culture's perceiving of shapes to support the meaning (e.g. Japan's preference of round shape that is experienced as positive, whereas cross has more negative meaning).
- using sounds as indication of actions (though users environment of usage should be carefully considered).
- using high-context graphics to support navigation and interaction (Baumgartner 2003, 24).

Intuitive Ways of Interaction

"Interaction with the software should be done in a way that is natural and easy for the user."

User should be provided with ways of interaction that are familiar and usual for him. Indications of preferable actions should be provided. These should help the user to understand what is expected to be done and how.

Intuitive ways of interaction can be supported by:

- usage of interaction behaviors that are based on the real world (e.g. swiping the screen to move to next or previous page of the document).
- showing clearly the connections of different components of the software.
- giving instruction messages to prompt actions (e.g. "Swipe the screen to unlock").
- providing clear structure of the software.

Certainty of the Results of One's Actions

"User should be able to tell what the results of his actions are before actually conducting them."

The experiential learning (try and see what happens, the next time you know better) that is widely used in Europe would not work in Japan because of their high preference for uncertainty avoidance. For the Japanese it is highly preferable to know what the results of their actions are before actually conducting them. Like described in Ito & Nakakoji (1996, 115) "Japanese users read instruction manuals very carefully before they start using a system", by this they try their best to avoid breakdowns.

Certainty of the results of one's actions can be supported by:

- providing wide manuals describing the functionalities of the software.
- creating simplicity by limiting the choices, presenting clear metaphors and limiting the amount of data (Marcus and Gould 2001, 19).
- providing adjunct hints (color, font, sound) for reducing ambiguity (Marcus et al. 2001, 20). Cf. usage of high-context elements (see previous page).
- providing navigation in the system that prevents the user from getting lost (Marcus et al. 2001, 19), clear indications of the current location in the system and what are the previous and next steps.
- using user confirmation for actions that become irreversible once they are done.
- Providing meaningful labeling to the objects.

Clear Order and Progress of Tasks

"There should be a clear linear order in which the tasks should be done and the progress should be visible to the user as the task(s) and project(s) proceed."

Monochronic cultures prefer to have clear schedules and plans to follow. It is also important to be able to track down how much of the project is done and what sort of dependencies exist between the tasks, e.g. "in order to be able to do this, you should first define this". The monochronic cultures prefer going through a task systematically, and therefore prefer linear presentation of material.

Clear order and progress of tasks can be supported by:

- using layout that indicates the relationships between different components and the order in which they should be gone through.
- using subtasks to complete bigger task.
- using linear interaction patterns.

Flexibility of the Time Consumption

"User should be able to close the system in the middle of a task and be able to return to the same state when opening the system again without losing any data."

Since monochronic cultures put the time usage over completeness of the task, it is important for the software to enable the user to close the system in the middle of a task without losing any information and to be able to continue working from the same point when returning to use the software again. When the user next time opens the software it should be in the same state as when closing it the last time or provide indication of the task that was left in the middle.

Flexibility of time consumption can be supported by:

- creating small tasks that can be completed in a short period of time.
- returning to the same view of the software as when closing, when reopening the software.
- showing the status of the tasks in the overview of the system.

Hierarchical Structure

"Information shall be presented in a hierarchical structure and the access to different parts of this information shall be determined by the user's hierarchical user level."

In high power distance cultures it is important to show the hierarchical structure of different organizations as well as the hierarchy of information.

Usage of hierarchical structure can be supported by:

- providing different user levels that have only access to the information that is relevant to them.
- presenting the contents of the software in a hierarchical order.
- providing information and tools only relevant to the current content of the view.

References

Barber, W. & Badre, A. 1998. Culturability: The Merging of Culture and Usability. A paper presented in 4th conference on human factors & the web in Basking Ridge, NJ, USA. Referred to 11.3.2013. http://research.microsoft.com/en-us/um/people/marycz/hfweb98/barber/index.htm

Attachments

Color-Culture Chart presented in Barber and Badre (1998).

Color	China	Japan	Egypt	France	United States
Red	Happiness	Anger Danger	Death	Aristocracy	Danger Stop
Blue	Heavens Clouds	Villainy	Virtue Faith Truth	Freedom Peace	Masculine
Green	Ming Dynasty Heavens	Future Youth Energy	Fertility Strength	Criminality	Safety Go
Yellow	Birth Wealth Power	Grace Nobility	Happiness Prosperity	Temporary	Cowardice Temporary
White	Death Purity	Death	Joy	Neutrality	Purity

Appendix 5. Japanese and English numerals

Number	Power notation	Numeral in Japanese	Numeral in English
1	10^0	Ichi	One
10	10^1	Jū	Ten
100	10^2	Hyaku	Hundred
1000	10^3	Sen	Thousand
10000	10^4	Man	Ten thousand
100000	10^5	Jū-man	Hundred thousand
1000000	10^6	Hyaku-man	Million
10000000	10^7	Sen-man	Ten million
100000000	10^8	Oku	Hundred million
1000000000	10^9	Jū-oku	Billion
10000000000	10^{10}	Hyaku-oku	Ten billion
100000000000	10^{11}	Sen-oku	Hundred billion
1000000000000	10^{12}	Chō	Trillion

Appendix 6. Checklist of Objective Matters of Japanese Culture

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Objective Matters of Japanese Culture

Language

- ✓ Japanese

Time Format

- ✓ 24-hour clock, hours on the left side, minutes on the right side (e.g. 20:59).
- ✓ Colon (:) separating hours and minutes.
- ✓ With hours that have only one digit no zero is presented in front of the hour (e.g. 8:32).

Date Format

- ✓ Date presented in the order of year, month, day.
- ✓ Use either dots (.), slashes (/) or suffix (year 年, month 月, day 日) as a separator.
- ✓ In cases dots or slashes are used as separators months and days should be presented in two digit format (e.g. 2013.02.03).
- ✓ In case suffixes are used as separators one digit format of days and months is allowed (e.g. 2013 年 3 月 1 日).
- ✓ In cases that the day of the week is presented, it should be shown on the right side of the date.

Calendar Format

- ✓ Use Gregorian calendar.
- ✓ The week on a calendar starts on Sunday and ends on Saturday.

Text Format

- ✓ Use yokogaki (from left to right and top to bottom) in user interfaces.
- ✓ Use tategaki (from top to bottom and right to left) in wide manuals.

Number Formatting

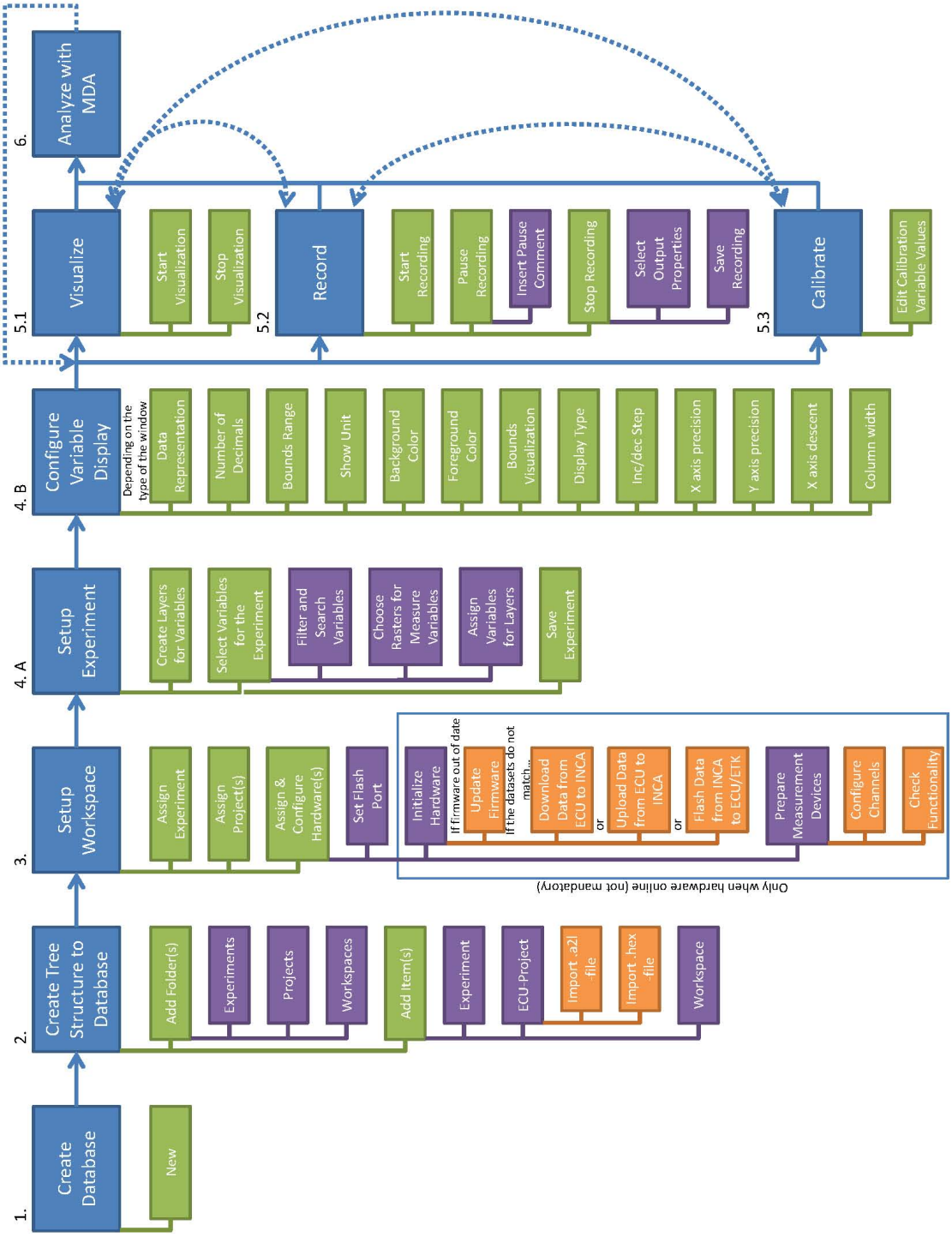
- ✓ Use Arabic Numerals.
- ✓ When feasible group large numbers in groups of four digits (e.g. 10 0000 1234).

Currency

- ✓ Use Arabic Numerals to show the amount of money.
- ✓ Use ¥ in front of the number or 円 after the number as a symbol of Japanese yen.
- ✓ In the presentation of large amounts of money use groups of three digits that are separated with comma (,) (e.g. ¥10,000).
- ✓ Do not use decimal numbers to present the amount of money (¥1 is the smallest amount of money that exists in Japan).

1 Created: 2013-03

Appendix 7. Task Flow Used in Heuristic Evaluation.



Appendix 8. Heuristic Evaluation Findings.

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Appendix 9. Paper INCA User Survey (English)

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INCA USER SURVEY

We at ETAS hope to improve the usability of our systems, so that they would become easier to use for the users (you) and that the systems could support your tasks better.

Filling this short survey will take less than 15 minutes of your time. By filling the survey you can help us to understand the background and the needs of the Japanese users for our user interfaces. With this information we hope to develop our user interfaces so that the system becomes easier for you to use and that it supports your tasks and needs better.

In multiselection questions, please add a cross in the checkbox of the option that you want to choose. In a case multiple options fit, please add cross to all the checkboxes you want to select. In a case "other" is selected; please fill in your information on the line provided after the option. (*E.g.* "☒*Other, what? Mechanic* "). In the questions without any options please fill in your answer to the lines provided underneath the question.

Thank you for your participation in this study. It is highly appreciated.

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1. Background Information

1.1 How old are you?

☐20-34
☐35-44
☐45-54
☐55-65

1.2 In which company do you currently work at?

1.3 What is your current position?

☐Calibrator
☐Team leader
☐Function developer
☐Data administrator
☐Other, what?

1.4 How long have you been working in this position?

☐Less than 1 year
☐1-2 years
☐2-3 years
☐3-4 years
☐More than 4 years

1.5 Did your studies focus more on the topics related to hardware or software?

☐Hardware
☐Software
☐Other, what?

2. Current Work

2.1 In your current work with INCA, do you work in a team or by yourself?

☐By myself
☐In a team, with how many people?

2.2 How do you divide the taks in the team?

2.3 In which environment do you use INCA the most?

☐At office
☐At test bed
☐At driving track
☐Other, what?

2.4 What are the usual tasks that you have in your current work?

☐Preparing for calibration tasks with project files and calibration data received from team leader
☐Defining and configuring hardware in the office
☐Defining and configuring hardware at the test bed
☐Defining and configuring hardware in the vehicle
☐Setting up INCA Experiment for required calibrations
☐Recording in INCA
☐Analyzing recorded files in MDA
☐Preparing calibration data to return it to team leader
☐Providing project and calibration data to calibration engineers
☐Comparing and copying calibration data obtained from calibration engineers into new dataset
☐Other(s), what?

3. Working with INCA

3.1 Which version of INCA do you use?

☐V5.4.1
☐V6.2.1
☐V7.0
☐V7.1
☐Other, which?

3.2 How long have you been using INCA?

☐Less than 1 year
☐1-2 years
☐2-3 years
☐More than 3 years

3.3 What are your usual tasks with INCA?

☐Setting up Database
☐Configuring hardware device(s)
☐Assigning Project and hardware to Workspace
☐Selecting variables for Experiment
☐Configuring the variable displays
☐Measuring and recording values
☐Changing calibration variables
☐Analyzing recorded data with MDA
☐Comparing calibration data with CDM
☐Merging data into a new dataset in CDM
☐Other(s), what?

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3.4 How do you know what needs to be done next whenyou are working with INCA?

☐Professional knowledge
☐Was told in the training
☐Ask guidance from a colleague
☐Look up from manual
☐User interface guides
☐Other,how?

3.5 How do you know where you left off INCA the last time and where you want to continue from?

☐I remember where I left off
☐I make a note to myself
☐I can see it from INCA
☐I browse INCA to see what is done
☐Other, how?

3.6 Which of the following parts of INCA do you use?

☐Database Browser
☐Experiment Environment
☐Variable Selection
☐Hardware Configuration
☐Measurement Data Analyser
☐Calibration Data Manager
☐Calculated Signals
☐Recorder Manager
☐Other(s), which?

4. Difficulties with INCA

4.1 Could you please describe the three major difficulties that you have with INCA.

Issue 1

Issue 2

Issue 3

4.2 Where do you first look for help when you encounter a problem with INCA?

☐From a colleague
☐Manual
☐INCA Hotline
☐Other, what?

4.3 Do you prefer using electronic or printout version of the manual?

☐Electronic
☐Printout
☐I do not care

5. Specific Questions about INCA

5.1 Do you use multiple Databases?

☐No
☐Yes, for what reason?*(e.g. for different test vechicles)*

5.2 Do you re-use old Experiments?

☐No
☐Yes, for what reason?*(e.g. for different versions of the same hardware)*

5.3 Do you use more than 1 tab in the Experiment Environment?

☐No
☐Yes, what is the criteria for the arrangement? *(e.g. type of variable)*

6. Usability Activities at ETAS

6.1 Would you be interested in taking part in other similar studies as this one to help to improve the usability of ETAS systems?

☐No
☐Yes, could you please provide your contact information:

Thank you for taking part in this survey.
Your effort is greatly appreciated.

Please return this form to ETAS representative.

Appendix 10. Electronic INCA User Survey (Japanese)

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INCA ユーザーアンケート

この度は「INCA ユーザーアンケート」にご協力いただきまして、誠にありがとうございます。

本アンケートの目的は、お客様の業務の中で INCA がどのように使用されているのかを調査することです。

ご記入いただきました内容は、ETAS 社内においてのみ扱わせていただき、より使いやすい製品をお客様にお届けするための情報として活用させていただきます。

質問は全部で 22 問あります。10～15 分程で回答できる内容となっておりますので、ご協力の程よろしくお願いいたします。

このアンケートに対する回答は、該当する箇所にマークを入力してください。質問の回答が「その他」の場合は、その理由または内容をご記入ください。

[例]

1.3 お客様の職位をお答えください

☐ 適合担当者

☐ チーム マネージャ

☐ ファンクション開発者

☐ 適合データ管理者

☑ その他（システム開発者）

お忙しい中、ご協力いただきありがとうございます。

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1. お客様について

1.1 お客様の年齢

☐ 20-34 歳
☐ 35-44 歳
☐ 45-54 歳
☐ 55-65 歳

1.2 御社名

1.3 お客様の職位

☐ 適合担当者
☐ チーム マネージャ
☐ ファンクション開発者
☐ 適合データ管理者
☐ その他

1.4 現在の職位での INCA のご使用期間

☐ １年未満
☐ １～２年未満
☐ ２～３年未満
☐ ３～４年未満
☐ ４年以上

1.5 お客様の中心とする業務分野

☐ ハードウェア関連
☐ ソフトウェア関連
☐ その他

2. 現在の従事する作業について

2.1 お客様の INCA を使用する作業について、作業に従事する人数をお答えください

☐ １名（お客様のみ）
☐ チーム。　　名で作業に従事

2.2 チーム内での、作業の分担方法をお答えください

2.3 **最も** INCA をご使用になる場所をお答えください

☐ オフィス
☐ テストベンチ
☐ テストトラック
☐ その他

2.4 現在の作業で、担当する作業内容

☐ チームマネージャより提供された INCA ファイル (プロジェクト、適合済みデータなど)の設定
☐ オフィスにて、ハードウェアの設定
☐ テストベンチにて、ハードウェアの設定
☐ テスト車両にて、ハードウェアの設定
☐ 適合用の実験画面のセットアップ
☐ INCA で測定データの記録
☐ MDA で測定データを分析
☐ チームマネージャに送付する適合データの作成
☐ 適合エンジニアに送付するドキュメントと適合データの作成
☐ 複数の適合データをまとめて１つの新しいデータセットの作成
☐ その他

3. INCA の使用経験について

3.1 お使いの INCA バージョン

☐ V5.4.1
☐ V6.2.1
☐ V7.0
☐ V7.1
☐ その他

3.2 INCA のご使用期間

☐ １年未満
☐ １～２年未満
☐ ２～３年未満
☐ ３年以上

3.3 INCA で担当する作業内容

☐ データベースのセットアップ
☐ ハードウェアデバイスの設定
☐ プロジェクト作成とワークスペースへの割り当て
☐ 実験に使用する変数の選択
☐ 変数表示の設定
☐ 測定と測定データの記録
☐ 適合変数の値の編集
☐ MDA で測定データの分析
☐ CDM で適合データの比較
☐ CDM で適合データを新しいデータにマージ
☐ その他

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3.4 INCAの操作方法がわからない場合、どのように調べますか
☐ 自分の知識で解決する
☐ トレーニングで説明を受けたことを振り返る
☐ 指導を同僚に依頼する
☐ マニュアルを調べる
☐ ユーザーインターフェイスガイドを調べる
☐ その他

3.5 INCAで作業を中断後に再開する場合、どのようにして再開箇所を思い出しますか
☐ 作業を中断した箇所を覚えている
☐ ノートにメモを残す
☐ INCAを見ることで再開箇所がわかる
☐ どこまで作業を行ったかを思い出すために、INCAを操作する
☐ その他

3.6 お使いのINCAの機能
☐ データベースマネージャ
☐ 実験
☐ 変数の選択ダイアログボックス
☐ ハードウェアコンフィギュレーション
☐ 測定データアナライザ（MDA）
☐ 適合データマネージャ（CDM）
☐ 演算シグナル
☐ レコーダマネージャ
☐ その他

4. INCAの課題について

4.1 INCAが改善すべき点を3箇所お答えください
課題1

課題2

課題3

4.2 INCAで問題が発生した場合、最初にどこに問い合わせますか
☐ 同僚
☐ マニュアル
☐ INCAホットライン
☐ その他

4.3 どちらの形式のマニュアルが使いやすいか、お答えください
☐ 電子マニュアル
☐ 製本マニュアル
☐ どちらでもよい

5. INCAの使い方について

5.1 複数のデータベースを切り替える
☐ いいえ
☐ はい。その理由（[例]テスト車両ごとにデータベースを切り替える）

5.2 実験画面を再利用する
☐ いいえ
☐ はい。その理由（[例]同じハードウェアでバリエーションが異なるテストが多い）

5.3 実験画面で複数のレイヤ（タブ）を使用する
☐ いいえ
☐ はい。その基準（[例]変数の種類でレイヤを切り替える）

6. ETASでのユーザビリティ改善活動

6.1 今後もINCAのユーザビリティ向上のためのアンケートにご協力いただけますか
☐ いいえ
☐ はい。ご連絡先

お忙しい中、「INCA ユーザーアンケート」にご協力いただきありがとうございました。
「フォームを送信」ボタンをクリックして、ご返送ください。

Appendix 11. Connections between the survey questions and cultural heuristics

Question	Cultural Heuristic	Aim of the question
In your current work with INCA, do you work in a team or by yourself?	Hierarchical Structure	To define if there are different types of users than already known (calibrator & team leader).
How do you divide the tasks in the team?	Hierarchical Structure	To define how the tasks are divided within a team, if there would be a need for user levels based on these tasks.
In which environment do you use INCA the most?	Basic Information	To give an image of what sort of environment the user is using the software the most. Could the interaction in this environment be supported somehow better.
Could you please describe the usual tasks that you have in your current work.	Intuitive Ways of Interaction & Clear Order and Progress of Tasks	What are the main tasks of the user and how INCA is part of them? Does the software support these tasks and the order in which they are executed in.
Which version of INCA do you use?	Basic Information	Explains of which INCA version the experiences are from.
How long have you been using INCA?	Basic Information	Gives information about the experience level of the user, helps to understand what sort of problems the novice and expert users have.
Could you please describe your usual tasks with INCA.	Intuitive Ways of Interaction & Clear Order and Progress of Tasks	Provides information about the main tasks and order of them that user does with INCA. Helps to analyze if the layout and structure of the system supports that.
How do you know what needs to be done next when you are working with INCA?	Certainty of the Results of One's Actions & Clear Order and Progress of Tasks	Gives information about the understandability of the system (the layout, design, etc.) and if it supports the interaction with the system.
How do you know where you left off INCA the last time and where you want to continue from?	Flexibility of Time Consumption & Clear Order and Progress of Tasks	Provides information about how the user manages with tasks that cannot be completed at once.

Which of the following parts of INCA do you use?	Hierarchical Structure	Gives information about the needs of the user from INCA and what is less relevant for them. Help to define the needs of different user levels.
Could you please describe the three major problems that you have with INCA.	All	Give information about which problems the users feel are the biggest ones for them. Could be related to any of the heuristics.
Where do you first look for help when you encounter a problem with INCA?	Intuitive Ways of Interaction	What is the natural source of information search for the user, how the user could be supported better.
Do you prefer using electronic or printout version of the manual?	Intuitive Ways of Interaction	Should the material be provided originally in electronic or printout format.
Do you use multiple Databases?	Hierarchical Structure & Clear Order and Progress of Tasks	Are multiple databases used, should the system support interaction between them better.
Do you re-use old Experiments?	Hierarchical Structure & Clear Order and Progress of Tasks	How the user structures the Database and Workspace(s).
Do you use more than 1 tab in the Experiment Environment?	Hierarchical Structure & Clear Order and Progress of Tasks	What is the hierarchical structure that is being used. Could this be supported better.

Appendix 12. INCA User Survey Responses.

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

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[Material deleted due to confidentiality]

Appendix 13. INCA User Interview Guidelines.

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User Interview Guidelines

Document Meta Data

Project Name	A case study of the effects of culture on user experience, when localizing a product to Japanese markets (shown on ETAS INCA).
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A case study of the effects of culture on user experience, when localizing a product to Japanese markets (shown on ETAS INCA).
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Instructions to the Interviewer

This guideline instructs you through conducting a user interview in a customer company regarding INCA.

The text in the same format as this one (blue, bold and italic) is a text meant only for you, to give some hints and advices about topics to which you should pay attention to and provide guidance on how to continue.

While going though the interviews, try to keep the style of the session conversational providing relaxed and comfortable setting. It is not required to follow the exact question pattern as presented here and if there is some topic that you find interesting during the interview, please do not hesistate to ask a follow up questions. However, try to keep these questions open and unbiased, so that the interviewee has a chance to form his own opinion about the topic.

Example of biased and closed question that offers the interviewee a chance to only answer with "yes or "no" and has a bias for the participant "to like" INCA:

"Do you like INCA?"

Instead try a style that does not favour liking or disliking; and that offers the interviewee a chance to explain a bit more about his opinion:

"What is your opinion regarding INCA?"

During the interview it is good to have good and warm relationship with the interviewee; however the interviewer should try to stay unbiased, since the interviewee's opinion might get affected by the interviewer's personal opinions regarding the system. It is not unusual that the interviewee tries to please the interviewer and provide only answers that he thinks the interviewer wants to hear. However this sort of answers do not give proper information about the interviewee's real opinions and may even result in false interpretations of the situation and therefore lead to wrong design decisions. If the interviewee tries to ask for your opinion of the topic or your confirmation, try to lead the conversation back to the interviewee, by e.g."is that what you think?", "it would be more interesting to hear about your point of view on this matter", "what do you think about it?".

Besides asking the questions try to observe the interviewee's body language. Is the interviewee frustrated with certain topics (during interview or observation), what? Is there something that the interviewee seems to especially enjoy (smiling, relaxed)? Does the interviewee look like he is confused about something, what? Does he look bored or tired, when? You can note these observations next to the topics during which they occur.

Do not ask the interviewee to fill in the answers, but ask each of the questions from the interviewee and fill in the answers in the areas provided in this guideline. This guideline is not meant to be given to the interviewee to fill and follow.

As Ms. Karpoff will be there during the interviews observing the session, if you have any further questions please write them down on a paper and pass them to Ms. Karpoff at a point that it will not disturb the interviewee. Please try to keep the session as undisturbed as possible, turn off your phone or other devices that might distract you and give your complete focus to the interviewee. In a case the interviewee looks like he could use a break, please ask him if he would like to take a short break.

[redacted]

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Instructions for Filling in the Answers

There are three types of input formats that occur in this interview:

1. Text input – write down the participant's answers and comments

2. Checkbox selection – make a cross in the box that presents the interviewee's answer. E.g.

> *What is your educational level?*
>
> *☐College of technology ☒Bachelor's degree ☐Master's degree ☐Ph.D ☐Other*

In these cases you can also mark multiple options, if the interviewee for example has both graduated from college of technology and has master's degree:

> *☒College of technology ☐Bachelor's degree ☒Master's degree ☐Ph.D ☐Other*

If the interviewee provides another answer than one included in the existing options, please mark "Other" and write down e.g. the degree in the space provided after "If other, what?".

3. Ranking items – indicate the ranking provided by the interviewee with numbering. E.g.

> *Could you please rank the following parts of INCA based on the amount of time that you spent with them? (1 for the part that is most used, 5 for the least used part)*
>
> *④Database Browser*
> *③Experiment Environment*
> *①Variable Selection*
> *②Measure Data Analyzer*
> *⑤User Interface Developer*

This means that the interviewee uses Variable Selection the most, Measure Data Anlayzer the second most, Experiment Environment third most, Database Browser the second least and User Interface Developer the least.

If additional space is required to make notes, please use the other side of the paper or additional papers provided for notes.Provide clear indication to which topic the note is linked to, e.g.

> **Regarding the tab arrangement in Experiment Environment…*
> *Besides the categories that were described, the criteria of the tabs changes based on the on-going project and it's requirements.*

[redacted]

Pre-Interview Information (from Interviewer)

Please fill in the following fields before starting the interview. These fields will provide background information about the setting of the interview as well as your contact information for further questions regarding this interview.

Your name and department:_____

The customer company in which the interview is done:_____

Date and time of the interview:_____

Are there other activities (e.g. presentations, training) included in the customer visit besides the interview?

☐No ☐Yes, what?_____

Any other information that you would think could be useful in order to understand the setting of this interview?

_____

_____

_____

_____

_____

[redacted]

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Welcome

Welcome and thank you for your time. My name is Elisa Karpoff and here is my colleague [redacted], we will conduct this interview about INCA with you and take minutes.

We at ETAS hope to improve the user interfaces of our products, so that they would better support the tasks and preferences of the users. This interview is a part of a study that we are conducting at ETAS to discover more information about our Japanese users and the conditions in which they use INCA. Our goal is to gain practical findings on the use of the software and the conditions of use. These findings serve to further improve the operation of the software.

The interview will take approximately 1 hour and will consist of the following parts:

1. Initial interview
2. Your typical tasks at the work and with INCA
3. Environment in which you use INCA
4. How you work with certain parts of INCA
5. Concluding interview

For the participants who are taking part only in the interview (no observation).

We will spend most of the time with parts 2 and 4. We want you to feel comfortable, so tell us if you need a break or if you want to terminate the interview.

For the participants who are taking part in both interview and observation.

We will spend most of the time today with parts 2 and 4 of the interview. Tomorrow we would like to observe your work, so that we can see how you handle INCA. The goal of the observation is to evaluate how well the software fits your tasks and how you use INCA. **We are not evaluating you**, but the software. We want you to feel comfortable, so tell us if you need a break or if you want to terminate the interview.

[redacted]

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Interview

Then let's begin with the interview part of today. If there is some information that you do not feel comfortable sharing please feel free to decline from answering and let us know that you would like to move on to another question. All the questions are completly voluntery. I would like to remind you that you have the right to terminate the interview at any point. Please let us know if you would like to have a break.

1. Initial Interview

The purpose of these questions is to collect background information of the interviewee that may explain the reasons behind certain behaviors and preferences; and provide useful information about the interviewee.

We would first like to start with some basic background information about you and your experiences with technology.

Basic information

How old are you? ☐20-34 ☐35-44 ☐45-54 ☐55-65

What is your current position/title?
☐Calibrator ☐Team Leader ☐Other, what?_____

How long have you been working in your current position?
☐Less than 1 year ☐1-3 years ☐More than 3 years

On what topics did your studies focus on?
_____

Previous work experience

Did you have some work experience before you started to work in your current position?
☐Yes ☐No

Only if the interviewee had been working before continue to the following questions, otherwise jump to the "Experiences regarding technology" –part.

In what position were you working before?
_____

How long were you working in the previous position?
☐ Less than 1 year ☐1-3 years ☐More than 3 years

[redacted]

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Experiences regarding technology

In your freetime do you use technological devices such as mobile- or Smartphone, computers, game consoles and so on?

☐Don't use ☐Mobile Phone ☐Smartphone ☐Computer ☐Game Consoles

☐Other, what?_____

What are your usual activities with these devices?

☐Communicating ☐Playing Games ☐Watching Videos ☐Search for Information

☐Other, what?_____

What are your favourite features in these devices?

_____

_____

_____

What are the features that you dislike in these devices?

_____

_____

_____

How much time do you spent with these devices on your freetime (e.g. during train rides, at home, at gym…)?

☐Less than 30min/day ☐1 to 2h/day ☐3h/day ☐More than 4h/day

[redacted]

2. Current Work

The purpose of this part of the interview is to get some information about the current tasks that the interviewee does at work and how much of the worktime he spents with INCA. This will help us to identitify how INCA is connected to other parts of the interviewee's work.

Now let's move on to discuss about your work. The purpose of this part of the interview is to identify your usual tasks and to learn about your work with INCA.

What is usually the first thing that you do once you arrive to work?

_____
_____
_____
_____

What are your usual tasks during the day in your job?

_____
_____
_____
_____

What do you do last before leaving from work?

_____
_____
_____
_____

Did you have any knowledge about ECU calibration before starting to work with INCA?

☐Yes ☐No

How did you learn how to use INCA?

☐Training from a colleage with experience on using INCA

☐Training provided by ETAS

☐Manuals

☐Other, how?_____

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Which version of INCA do you use currently?

☐V5.4.1 ☐V6.2.1 ☐V7.0 ☐V7.1 ☐Other, which? _____

How much of your work time do you spent with INCA?

☐Less than 3 hours/week ☐3 to 15 hours/week ☐15 to 25 hours/week ☐More than 25 hours/week

Could you please rank the following parts of INCA based on the amount of time that you spent with them? (1 for the part that is most used, 6 for the least used part)

☐Database Browser

☐Experiment Environment

☐Variable Selection

☐Hardware Configuration

☐Measurement Data Analyser

☐Calibration Data Manager

Could you please describe a typical task that you do with INCA.

_____

_____

_____

_____

What are the steps that are required to accomplish this task?

_____

_____

_____

_____

How do you know which are the next steps that you need to take while executing a task with INCA?

_____

_____

_____

Do you usually do a certain task at once or do you continue with the task for example the next day?

☐Do task at once ☐Continue with the same task on another day

How do you usually over come the difficulties that you have while using INCA?

☐Help from Manual ☐Help Offered in INCA ☐INCA Hotline ☐Advice from a Colleague

☐Other, how?_____

[redacted]

What are the three major difficulties that you have while using INCA?

Issue 1

_____

_____

Issue 2

_____

_____

Issue 3

_____

_____

Do you prefer using the printout or electronic version of the manual?

☐Printout ☐Electronic ☐I do not care

3. Environment of Use

Next we would like to ask you some questions about your usual working environment where you use INCA.

How would you devide the time that you spent with INCA for each of the following environments?

(e.g. 20% at office, 40% at test bed, 40% at the driving track)

_____% at the office, _____% at the test bed, _____% at the driving track,

_____% at other place, where?_____

Do you usually work in a team or by yourself?

☐By myself ☐In a team

If you work in a team, how many people are included in the team besides you?

☐1 ☐2 ☐3 ☐4 ☐5 ☐more than 5

How are the tasks divided in the team?

_____

_____

_____

_____

[redacted]

4. Questions about INCA

Next we would like to ask some specific questions regarding your preferences while using INCA.

Do you use more than one Database in your work?

☐Yes ☐No

In case the interviewee uses more than one Database, please ask the following question; otherwise jump to the next question.

What are your criteria for creating a new Database?

_____

_____

_____

Do you re-use your old Experiments?

☐Yes ☐No

If the interviewee re-uses old Experiments, please ask the following question; otherwise jump to the next question.

In which occasions do you re-use your old Experiments?

_____

_____

Do you usually use more than one tab in the Experiment Environment?

☐Yes ☐No

If the interviewee uses more than one tab in the Experiment Environment, please ask the following question; otherwise jump to the next section.

What is the criteria based on which you divide the windows to the tabs in Experiment Environment (e.g. the window type, overview on certain values related to each other…)

_____

_____

_____

[redacted]

Concluding Interview

Lastly we would like to ask about your opinions regarding this interview; and overall about INCA and ETAS.

How do you feel about the interview?

_____
_____
_____

What is your overall impression about INCA?

_____
_____
_____

Are there some topics that you would like to discuss regarding the topics discussed here today?

_____
_____
_____

Do you have any questions regarding the interview or INCA?

_____
_____
_____

Would you be interested in taking part in similar activities as the ones conducted today later on?
☐Yes ☐No

If yes, could you please provide us your contact information for future contact

_____

Thank you for participating in this study.

[redacted]

Post-Interview Information (from Interviewer)

What sort of feeling did you get from the interview?

Was the interviewee openly discussing about the topics or being polite (not providing critic)?

_____

Were there any disruptions during the interview?

☐No ☐Yes (describe under what sort of disruptions)

_____

_____

_____

Were there any other people in the area of the interview?

☐No ☐Yes, who?_____

Were there some problems during the interview?

_____

_____

_____

Other additional impressions?

_____

_____

_____

Regarding the interview guidelines…

Were the interview guidelines helpful or not helpful to you? Why?

_____

_____

_____

Do you have any suggestions on how these interview guidelines could be improved?

_____

_____

_____

Thank you for taking the time and making the effort to conduct this interview.

[redacted]

Appendix 14. Presentation of the Purposes and Style of the User Interviews and Observations.

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

Appendix 15. INCA User Interview Results.

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[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

Appendix 16. INCA User Observation Guidelines.

DRIVING EMBEDDED EXCELLENCE

ETAS

Observation Guidelines

Document Meta Data

Project Name	A case study of the effects of culture on user experience, when localizing a product to Japanese markets (shown on ETAS INCA).
Project Number	
Document Name	Observation Guidelines.docx
Author	Elisa Karpoff [redacted]
Created on	2013-04-23
Document Version	1.0
Document Status	Final Version

[redacted]

Pre-Observation Information (from Observer)

Please fill in the following fields before starting the observation.

Your name and department:_____

The customer company in which the interview is done:_____

Date and time of the observation:_____

The experience level of the user being observed:_____

Any other information that you would think could be useful in order to understand the setting of this interview?

_____

_____

_____

_____

_____

[redacted]

Observation

We would like to observe you while you conduct your usual tasks. We know that us observing you might feel uncomfortable and unnatural, but please try to act as naturally as you can and imagine that we are not here. Try to keep in mind that we are not here to evaluate you, but the software and how well it fits to **your** tasks and needs.

As you might have some questions during the observation, please try to save them until the end of the observation. We might write down some notes regarding our observations or some topics that we would like to ask you about. We will ask these questions after the observation has finished.

Please continue with your work as we were not here.

During the observation observe the interviewee conducting his usual tasks. Pay attention to the following topics:

- ***Usual task flows (what is the order in which different tasks are done (e.g. assigning Project, Experiment or Hardware to a Workspace, the style in which the variables are assigned to a Experiment (e.g.first calibration variables and then measure variables, or based on the tab)).***
- ***Tasks in which the interviewee seems to have difficulties.***
- ***Preferable input method that the interviewee uses, is the keyboard used more than mouse? Are there some occasions that the system do not support this input method and the interviewee is required to change to the other one (e.g. keyboard commands are not implemented and the interviewee is required to use mouse when it would not be his first input method).***
- ***Besides the software, does the interviewee use some other equipment or inquire knowledges from other colleagues regarding certain topic? What? (e.g. uses paper table to remember the keyboard commands or other values).***
- ***Any other topic that you find interesting about the way in which the interviewee uses the system.***

During the observation keep silent and do not disturb the interviewee's work. Even when there is a way that you know the interviewee could do a certain task more easily, leave the meantion of it until the observation has finished. The goal is to discover these topics during the observation and to let the interviewee show how he works with the system. When the interviewee is disturbed during the observation, he might start to feel that he is not using the system correctly and adjust his behavior so that it does not resemble the usual way that he would use the system. Or the interruptions might affect his usual task flows, since he might loose track of what he was doing.

Please keep your focus in the observation situation and do not use your phone or check the time constantly. This may distract the user and leave an impression that his input is not important.

The next page is reserved for your notes and questions that may arise during the observation. If there is not enough space, please continue to the other side of the paper or to additional papers.

[redacted]

A case study of the effects of culture on user experience, when localizing a product to Japanese markets (shown on ETAS INCA).
User Interview Guidelines
| Version: 0.0 | State: Draft

DRIVING EMBEDDED EXCELLENCE

ETAS

Observation Notes

[redacted]

After Observation

We are now done with the observation of your work. Thank you for your co-operation in this matter. It was very informative for us to see how you work with the system. We hope that we can use these observations to improve the user interface, so that it could support the users better.

Let me ask from my colleague if there were some topics that she would like to ask you about the observations that were made.

Discuss with the other observer about topics that might need to be cleared regarding the observation.

Ask the interviewee about the topics that were unclear...

If there were no unclear topics and once the unclear topics are discussed...

Are there some topics that you would like to ask us about?

Thank you for your co-operation, it is greatly appreciated.

[redacted]

Post-Observation Information (from Observer)

Where there some distractions during the observation? What?

_____

_____

Do you feel that the user was feeling comfortable during the observation? If not, why?

_____

_____

What is your general impression about the observation?

_____

_____

_____

Thank you for taking the time and making the effort to participate in this user observation.

[redacted]

Appendix 17. Affinity Diagrams of the INCA User Observation Notes.

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[Material deleted due to confidentiality]

[Material deleted due to confidentiality]

[Material deleted due to confidentiality]