User Interface Design Principles for Finnish Websites' Localization in China Based on Cultural Dimensions

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Abstract

Globalization has enabled distribution of market over multiple cultures around the world. For international businesses, they need to bring culture elements into consideration while doing websites' localization. Studies have been done in carrying out cross-cultural UI design principles.

Finland has big potential of increase exportation to China since there are more and more Chinese visitors arriving in Finland these years. The research question of this thesis is how can Finnish companies' websites do better localization on their websites by applying cross-cultural UI design principles.

Previous researches have been studying on general cross-cultural UI design principles. But no one has done specific research between two cultures, we assume general study cannot cover all situations, neither accurate, since it might have compromised some specific detail while generating a general introduction. However, businesses need specific and accurate guidelines.

In this thesis, based on previous researches on general cross-cultural UI design principles, a case study will be carried out to study Finnish websites and Chinese websites. After that we will be able to review and modify general cross-cultural UI design principles to introduce guidelines for Finnish businesses doing better localization in China.

Conclusion is while narrowing down to specific culture, general cross-cultural UI design principles need to be modified.

Key words and terms: User interface, cross-cultural, UI design principles, localization.

Contents

1 INTRODUCTION

Along with the arrival of the information age, information technology is significantly changing our living environment and lifestyle. Rapid development of information technologies and applications has become an inseparable of most people's daily life. While using IT services, people interact with user interfaces to achieve their goals. User interface (UI) is the top layer of a software system which is in charge of communicating with users [Jacob, 2003]. Therefore, it plays an important role in the interaction events. User interface design forms one important aspect to usability of software system [Oppermann, 2002].

When Internet was not as developed as in recent years, software products were designed without much respect to users, so the users had to adapt to the system [Mandel, 1997]. Later on with the fast development in software industry, engineers had to apply user interface design principles in order to make the system adapt to the users [Mandel, 1997], ensure its quality, and make the system competitive. This research focuses on web UI design, where positions like front-end developer or UI designer are the most important roles in development. Development never stops, from the beginning of this century people realized there is a new indicator affecting the quality of UI, the culture [Kralisch, 2006].

For decades, resources, products and services has been globally distributed in trades, and the web makes it extreme through internet. Engineers in computer science or software engineering industry generally agree that UI design can create user dependence by improving appeal and usability. Studying and understanding users is a central issue of UI design process. Now with globalization, users could come from every corner in the world. Therefore, cultures are taken into consideration while studying users. Especially for companies who are operating international businesses, they have to consider the importance of how users from different cultures prefer to take and accept information from web [Marcus, 2001].

The rapid development of globalization increases the global market for many businesses. When designing the user interface of a website, it is important to consider how to correctly and effectively promote products toward cross-cultural market. Putting more effort to create good cross-cultural interfaces is the trend in web development.

While talking about a specific culture targeted market, China together with some other South-East Asian countries consist of a huge market. Figure 1 shows that more than one fifth of global internet users used Chinese as their preferred language in 2017, slightly less than English, which is used by 26,3 percent of global internet users [Statista, 2017]. Besides, China is the second biggest economy in the world [Statista, 2017]. These facts encourage a big number of international companies to enter Chinese market.

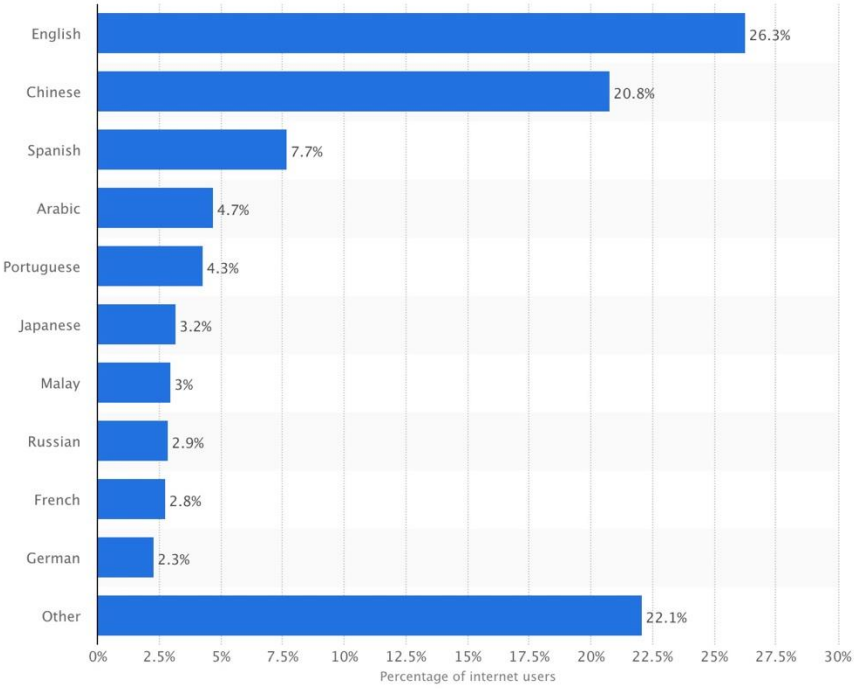

Figure 1. Most widely used languages on Internet in 2017.

As a Chinese living in Finland for many years, I have witnessed great growth in the number of Chinese visitors arriving in Finland, from 37,581 to 155,472 from 2010 to 2016 [Tilastokekus, 2018]. Although the number of visitors has significantly increased, the export total decreased from 2,733 million euros in 2010 to 2,680 million euros in 2016 [Tulli, 2018]. However, it does not mean that there is no rise in market demand for Finnish “products”. Goods, design, software products, tourism or even education are becoming popular products in China. Therefore, this research aims to answer the question: How should Finnish businesses present themselves to Chinese customers through their websites in the future?

This thesis introduces the background of user design and its principles and also culture and its dimensions. Reinecke and Abraham [2013] compiled of set of general cross-cultural user interface design principles, and based on those, this thesis conducts a case

study of the Finnish and Chinese websites to review their model of culture dimension affecting UI design principles between Finland and China. We believe a general set of UI design principles more or less requires modification while using it on a specific case. Therefore, this thesis introduces guidelines on designing a Chinese cultural-friendly web UI for Finnish businesses.

In the case study, a group of websites from different business areas from both Finland and China were selected as study samples. Referring to Reinecke and Abraham's cross-cultural user interface design principles, we list certain UI design elements under each principle. Several crawlers are used to collect data such as size, colour, brightness and position from these UI design elements. By seeing the differences between how Finnish and Chinese websites use or modify those UI design elements from the collected data, we are able to find the differences in UI design principles between these two cultures. Thus we discuss how Finnish companies' websites can do better localization in China after carrying out a new set of cross-cultural UI design principles in this specific case.

In Chapter 2, we will go through user interface design and its principles. In Chapter 3, culture as well as Hofstede's cultural dimensions will be introduced. In Chapter 4 and 5, we will carry out the research method and analyze the results. Discussion and conclusions will be introduced in Chapter 6 and 7.

2 USER INTERFACE DESIGN

2.1 User interface and user interface design

User interface (UI) is the top layer of a software system which is in charge of communicating with users [Jacob, 2003]. Web UI is the place where a website system displays information to users and takes their requests. The goal of this interaction is to allow users to conveniently and effectively manage their operations on the website system based on the information or feedback information provided by the website. By doing so, users are able to achieve certain aims as to get specific information, customized request. Therefore, a good UI means it can ensure normal users to use it smoothly without much help from the outside. This will help users to build confidence of using the system. Moreover, step by step users are willing and capable to explore new areas or functions and expand their experience or knowledge. [Mandel, 1997] Eventually users will become regular users of the website instead of just being random visitors or browsers.

User interface design is the process of designing such a good website's UI. According to Oppermann [2002], user interface design determines the usability of a software product. Stone et al. [2005] also argue that user interface design is important since people cannot live without computers and internet in everyday lives. With a large possibility of accessing to the internet, people often search and browse information or get support from a variety of websites. Service providers are building better websites to attract more users and remain competitive. Therefore, a good understanding and awareness of users' mental models as well as the physical, physiological, and psychological abilities of users are important.

According to Marcus [2001], there are five main elements of user interfaces: metaphors, mental models, navigation, interaction and appearances. Metaphors are fundamental concepts of realistic items or events in software system, such as a warning sign or chatroom. Mental models are structures, they might be consisted of data, functions, tasks, roles, and people in groups at work or play, such as a tool or some content. Navigation is the movements in mental models, such as menus or buttons. Interaction is input and output actions happening between users and system, such as user use

keyboard to input information and system use monitor to output results. Appearance refers to the visual aspects, such as colours, brightness, images, etc.

Marcus's introduction is more abstract, concretely, we can summarize as: user interface elements can be categorized in four parts: container elements, navigation elements, user-input elements and information elements. Container elements decide the basic layout of a UI and how other elements are arranged and displayed. Navigation elements determine how the navigations are performed during an interaction. User-input elements give users certain way of inputting their requests or information. Information elements decide how all types of information are displayed to users. Under these categories, there are a number of elements such as boxes, buttons, dropdown lists, warning messages, etc. A user interface is built of thousands of different types of UI elements, each unique consist of UI elements displays a unique UI.

2.2 User interface design principles

2.2.1 User interface design principles in the 1990s

Leonard [1996] introduced the golden rule of design which advises not to bring in bad designs you have experienced before into your own user interface design: "Do not do unto others as you would not like to do unto yourself." Leonard simply but accurately introduced the principle of UI design from the philosophy aspect. The principles have been updating along with the development of industry, we found two sets of UI design principles which are introduced in 1997 and 2011.

Mandel [1997], also introduced three golden rules for UI design: "Place users in control, reduce user's memory load, and make the interface consistent".

The first rule is to place users in control, and give more rights to users. Instead of trying to predict what the user wants, giving users the rights to operate by themselves can lead to more precise results which they aim to reach. The design principles under 'place users in control' are listed below [Mandel, 1997].

1.1. Use modes judiciously (modeless). A software system often uses two kinds of models, application model and system model. Application models are used to perform certain tasks for users, one model is usually responsible for one single task, user is not able to switch the window or panel unless confirm the operation or cancel it. System

models are used while system processing certain tasks for users, during this model user can only wait until the process is done.

1.2. Allow users to use either the keyboard or mouse (flexible). Both keyboard and mouse are important input windows. The reason of both their existence is that they cannot replace each other. Therefore, a good UI shall never restrict user with limited input methods, users shall be provided both methods.

1.3. Allow users to change focus (interruptible). Users prefer to be in control of the system instead of being controlled or forced by the system. Therefore, never force users to completing system predefined tasks: users shall have the freedom to process what they want as well as cancel the process if they feel not like to complete it. Assist users instead of trying to force them.

1.4. Display descriptive messages and text (helpful). While displaying information to users, make sure the system is using common terms instead of terminologies. Users are not often equipped with hardware or software knowledge.

1.5. Provide immediate and reversible actions, and feedback (forgiving). All software products shall be designed with undo and redo functions, users are not developers, they know nothing about how the program is performing and working behind. By providing users undo and redo functions, users can learn what are the results of certain actions they apply. If not, the system shall make sure consequences information is delivered to users before they apply the actions

1.6. Provide meaningful paths and exits (navigable). Navigation is the simplest and mostly used action while browsing on internet. Make sure the interface is provided with accessible navigation possibilities and encourage users to explore more information by using simple buttons and links.

1.7. Accommodate users with different skill levels (accessible). Users can be categorized into beginners, normal users and experts. Provide different navigation possibilities for different level of users: experts will not be happy to go through all details designed for beginners. For example, skip functions could be provided in some basic level processes.

1.8. Make the user interface transparent (facilitative). To serve well, software systems shall design interfaces according to users' mental model. In the other words, functions of the system shall be translated into user mental model friendly language. While user tries to leave a message on a website under contact page, it cannot be translated as send a record to our database.

1.9. Allow users to customize the interface (preferences). With the development of users' background knowledge, users are gradually looking for services which provide customization. A hundred users have a hundred personalities. When they become experienced users online, they will start looking for something designed closest to their requirements. That is why some users use Chrome while others prefer Firefox. It is impossible to design a special version of software for each single user, but developers can provide as many customization functions to help users create their own customized system.

1.10. Allow users to directly manipulate interface objects (interactive). While designing an interactive interface, developers shall learn users' mental models as well. All manipulatable objects shall be immediately recognised by users. If not, they might never be used since users do not know they can be picked up and dropped.

The second rule is reducing user's memory load. People are not good at remembering things, so UI design process shall always consider assisting users with necessary information. The design principles of reducing user's memory load are explained by Mandel [1997] as below.

2.1. Relieve short-term memory (remember). The system shall help relieve users' memory by storing and showing users assistant information while users need it. Users do not come to the system to practise their memory.

2.2. Rely on recognition, not recall (recognition). Provide pre-set options instead of requiring users to type values. It is much easier and efficient for users to input values by just few clicks on the interface. Pre-set options or values shall be easy to reach and recall. They help users to build reflection arcs, users can perform processes even quicker next time after they have established this kind of reflection arcs.

2.3. Provide visual cues (inform). While in a mode, visual cues can remind users where they are and what they are doing. It shows its importance while a user walks away from

the computer due to some interruption and comes back a while later. Visual cues can recall user's memory and help them to focus on the previous tasks quickly.

2.4. Provide defaults, undo, and redo (forgiving). Users can be uncertain while applying some actions and they might regret doing so. The solution is undo and redo functions. In order to cover most "regret possibilities", an interface shall provide some system default settings as well as several users' historical operation status. Therefore, users are able to either go back few steps or refresh to a system setting.

2.5. Provide interface shortcuts (frequency). Experienced users or the so-called regular users of a software system will look for short cuts to assist them completing tasks more efficiently. It can reduce the system load and traffic as well.

2.6. Promote an object-action syntax (intuitive). Object-action syntax implementation helps users to learn and remember the logic behind objects on the interface and actions/functions behind them. This process also helps to build users' reflection arcs, which will help users to understand better the system and working more efficiently on it.

2.7. Use real-world metaphors (transfer). Users would easily connect metaphors like symbols or terms to real-world reflections. Good metaphors help users to reduce memory load by connecting the actions or tasks with real-world events. However, developers shall be cautious while choosing metaphors, a bad choice may not help users to reduce their memory load but occupy this specific reflection arc for nothing.

2.8. User progressive disclosure (context). It is necessary to categorise actions on a system, by how often they are used by users. More frequently used actions shall be listed at a beginning level of the interface with navigations. Not commonly used actions can be listed in lower levels but still navigable.

2.9. Promote visual clarity (organize). The key value of graphic design is presenting information with a proper medium and properly arrange it on a specific area. While coming to UI design, the information display shall follow the same principle of graphic design and make all information visual clarity.

The third rule is making the interface consistent. A consistent interface will greatly improve the usability of a UI since users can use the knowledge they learnt or predict

the workflow of a website. The design principles under making the interface consistent are listed below [Mandel, 1997].

3.1. Sustain the context of users' tasks (continuity). System shall be designed in a logical way as well as the interface. While applying actions, users shall be aware of the logic of the action by certain consistent information displaying on the interface, for instance the steps achieved and steps coming up.

3.2. Maintain consistency within and across products (experience). Software systems from same business area might have similar structures as well as logic and interface. So bring in some experience from systems in the same business area. Users will transfer their knowledge and habits to a new software product only if the products share the same usability of other similar products. Otherwise users will have to start from zero, which might cause the loss of customers.

3.3. Keep interaction results the same (expectations). In order to help users to establish accurate reflection arcs, actions and results shall be clearly organized. The best principle is that a certain action can only lead users to a certain result, if results are uncertain after performing the action, users might get confused and dislike the product.

3.4. Provide aesthetic appeal and integrity (attitude). Although a pretty interface will not change the product functionality, it matters a lot on users' first impression. With same or similar functions, product with a prettier interface will defeat the other one.

3.5. Encourage exploration (predictable). In early education, kids are encouraged to be creative, teaching them the method of solving problems become more important than teaching them knowledge. Similarly, interfaces today or in the future shall encourage users to explore more with their experience and knowledge since development never stops, software products are always updating.

2.2.2 **User interface design principles in 2010s**

According to Bhaskar et al. [2011, page 45-60], another set of design principles is listed below. It consists of twenty parallel UI design principles. Authors of this paper also referred to some ideas from Wilbert O. Galitz [2007].

1. Aesthetically Pleasing. Interface with an aesthetic design delivers users good first impression and attract them to stay and explore. Besides, an aesthetic interface can display information more clearly [Galitz, 2007].

2. Clarity. A clear interface includes clear visual appearance, structure and logic. Visual elements and metaphors shall be designed realistic as well as easy to recognise and understand. A product is to help users achieve certain tasks, it has to have a clear interface to assist users to work with a clear logic, an interface without clarity can only make the tasks more complicated and difficult.

3. Compatibility. Compatibility refers to user compatibility, task and job compatibility and product compatibility. User compatibility means the UI design shall meet the users' needs or clients' requirements. Tasks and job compatibility means the structure of a system shall match the tasks that a user might do to achieve the goal. Product compatibility means while facing a specific user group, a newer version of a system or of a competitive product shall consider bring in the existing user habits, expectations and knowledge into consideration during the design. [Galitz, 2007]

4. Comprehensibility. A software system shall have its own logic, but this logic shall follow users' mental models. Users would like to easily notice the system is well structured and actions are clearly arranged and introduced.

5. Configurability. To enhance the sense of control, easy personalize and customize features shall be available in configuration. This also encourages users to adapt to different levels of experience. By providing configurability or customization possibilities, users are able to create their personalized interfaces which fits their user habits and preferences. By doing so, users gain better user experiences while saving developers from heavy work load of diversity design.

6. Consistency. A system shall have consistency design, similar elements should have similar design and appearance as well as functions and interact methods, they are also supposed to be displayed at same places on different pages; a certain action should always lead users to a same result. [Galitz, 2007]

7. Control. Control means a user feels in charge while interacting with the system, and the system is answering to user's actions. Users will feel stressed and frustrating if

machine is controlling the users instead. Besides, the interface shall present itself like a tool.

8. Directness. Direct tasks work more efficiently than redundant sequences, alternatives and assistant information shall be easily accessible by users while performing tasks.

9. Efficiency. User's eye and hand movements shall be used efficiently. Interface shall capture user's attention by presenting elements on the screen.

10. Familiarity. According to users' mental models and behaviour patterns, concepts and metaphors can be simulated in the interface to help users understand the system better. Therefore, the interface is better translated into a real-world friendly design [Galitz, 2007].

11. Flexibility. Flexibility of a system refers to how well it can full-fill different users' requirements. A flexible interface allows users to choose their own preferred workflow or habits to achieve the same tasks customization [Galitz, 2007].

12. Forgiveness. People make mistakes, system should foresee the potential mistakes users might make while using it. Friendly information or messages shall be displayed to remind users of these mistakes. Even after mistakes occurring, system shall show its forgiveness and encourage users to explore more [Galitz, 2007].

13. Predictability. Similar with No.12, system should foresee the mistakes users might make and try to avoid them happening in order to make the work more efficient and user-friendly. System shall also make sure users can complete tasks with no big problems [Galitz, 2007].

14. Recovery. Users could make mistakes; they are not sure about the consequence of an action as well. Therefore, provide necessary recovery or undo functions can help avoid those problems, it can assist users to explore and learn more as well [Galitz, 2007].

15. Responsiveness. Respond to users' actions shall be performed immediately after the action and outstanding. In terms of form, the respond could be either textual or visual, for examples notification messages, icons or other graphic elements and sound effects [Galitz, 2007].

16. Simplicity. Galitz [2007] introduced five ways of achieving that: releasing information step by step while only needed; provide pre-set values or options; use as few screen alignment points as possible; use as less information as possible to introduce common actions meanwhile saving space for information used to explain complicated actions; make the interface simple and clear.

17. Groupings. Grouping elements from a same category or with similar functions can help create a clear logic and structure to users. It also makes the interface easy to understand and use.

18. Grouping Using White Space. This principle is widely used today, Galitz [2007] suggests to use adequate separation with white space (or other simple elements) between groupings. He asks to be aware of the integration between white space and page scrolling performance.

19. Grouping Using Borders. This principle is widely used today as well, according to Galitz [2007], horizontal lines used to separate page sections shall be applied carefully. He also suggests horizontal lines could be used to outstand the separation of two adjacent areas.

20. Focus and Emphasis. Galitz [2007], recommends that visual emphasis is needed while there is some important part on the interface which need to be noticed by users, for instance warning messages. Visual elements can provide stronger contrast to the background than texts.

All twenty principles are listed with the same order used by Bhaskar et al. [2011, page 45-60]. Out of these twenty principles, Aesthetically Pleasing and Clarity are carried out at the first and second place. Meanwhile they are only two sub-principles under Mandel's [1997] reducing user's memory load and place users in control principles, although literally the meaning has remained the same. These two principles are mostly referring to the use of container elements and information elements from UI elements. From the introduction chapter we see that the aesthetics of the user interface plays an important role in gaining user's attention. Figure 2 shows the homepage of Apple's website in 1997 and 2018, a significant difference is the homepage in 2018 is much simpler and prettier. We can explain this change with two reasons. Firstly, aesthetically pleasing and clarity are attached more attention and importance in the 2010s by developers while they might be ignored or sacrificed by developers if there is a conflict

with other principles in the 1990s. Secondly, aesthetically pleasing and clarity standards have been changed after two decades.

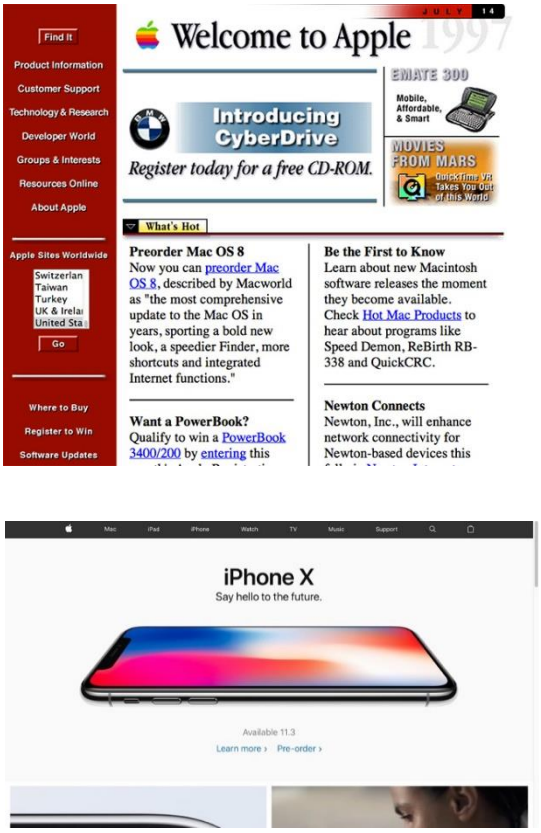

Figure 2. Apple website in year 1997 and 2018.

Besides, as displayed in second column of Table 1, we made a comparison between these two models introduced in year 1997 and 2011. By connecting the similar principles from Theo Mandel's model (1997 model in the following paragraphs) to *General Principles of User Interface Design and Websites* (2011 model in the following paragraphs), we notice that basically those principles have not been changed a lot, but the emphasis has. Compared with 2011 model, the 1997 model emphasises more on comprehensibility, configurability, efficiency and familiarity. Besides, we found Principle 6, 7, 8 in 2011 model literately have no difference with the three golden principles introduced in 1997 model; meanwhile they are the only three out of twenty principles in model 2011.

The conclusion is, one significant change is that Aesthetically Pleasing and Clarity became much more emphasized than before. From Google changing its logo and IOS releasing brand new operating system, UI design trends change every now and then.

Principles from ***General Principles of User Interface Design and Websites.*** Mandel as below [1997]	Similar principles in ***Theo Mandel's model.*** Bhaskar et al. [2011]
1. Aesthetically Pleasing	3.4, Provide aesthetic appeal and integrity
2. Clarity	2.9, Promote visual clarity
3. Compatibility	No specific principle matches
4. Comprehensibility	2.2, Rely on recognition, not recall 2.3, Provide visual cues (inform) 2.6, Promote an object-action syntax 2.8, User progressive disclosure
5. Configurability	1.1, Use modes judiciously 1.7, Accommodate users with different skill levels 1.9, Allow users to customize the interface 1.10, Allow users to directly manipulate interface objects
6. Consistency	3, Making the interface consistent
7. Control	1, Place users in control, and give more rights to users
8. Directness	2, Reducing user's memory load
9. Efficiency	1.6, Provide meaningful paths and exits 1.8, Make the user interface transparent 2.5, Provide interface shortcuts 3.5, Encourage exploration
10. Familiarity	1.8, Make the user interface transparent 2.2, Rely on recognition, not recall 2.3, Provide visual cues 2.6, Promote an object-action syntax 2.7, Use real-world metaphors 2.8, User progressive disclosure
11. Flexibility	1.1, Use modes judiciously 1.2, Allow users to use either the keyboard or mouse 1.3, Allow users to change focus
12. Forgiveness	2.4, Provide defaults, undo, and redo
13. Predictability	3.5, Encourage exploration
14. Recovery	1.5, Provide immediate and reversible actions, and feedback
15. Responsiveness	1.4, Display descriptive messages and text 1.10, Allow users to directly manipulate interface objects
16. Simplicity	2.9, Promote visual clarity
17. Groupings	1.6, Provide meaningful paths and exits 1.8, Make the user interface transparent
18. Grouping Using White Space	1.6, Provide meaningful paths and exits 1.8, Make the user interface transparent 2.9, Promote visual clarity
19. Grouping Using Borders	1.6, Provide meaningful paths and exits 1.8, Make the user interface transparent 2.9, Promote visual clarity
20. Focus and Emphasis	1.6, Provide meaningful paths and exits 2.5, Provide interface shortcuts

Table 1. Design Principles from *General Principles of User Interface Design and Websites* with comparison to Theo Mandel's model.

We see the importance of aesthetically pleasing and clarity principles in UI design nowadays. Plenty options of all kinds of services but fast paced everyday life make us easy to reach the service but difficult to switch to different service providers. Imagine there are two stores selling same products with same prices, but they place products on shelfs with different orders or methods, one user might always go to the same store if they first visited that one. User habits and switching costs can explain why this happens.

According to the research from Murray and Häubl [2007], when a user is used to use a particular online store, it creates a cost for the user, which means, it will cost the user time and effort to learn to understand and get used to a new online store. This cost can actually lock a user in the current service provider, until they feel the benefits of using the new product is enough to cover up the cost.

This is called “Switching costs”. Switching costs are defined as the costs of time, effort, habits, etc., that customers will have to pay while switching the product they are using [Burnham et al., 2003]. More specifically, switch cost may refer to the costs spent on searching, transaction and learning, a discount on user loyalty, habit, emotional costs and cognitive effort, as well as the financial, social and psychological risk [Fornell, 1992]. Switching costs are the obstruction while a user tries to use a new product or supplier [Wathne et al., 2001]. While the switching costs is beyond user’s ability, user will most probably continue use the current product or stay with the current supplier [Burnham et al., 2003].

For example, the reasons for people more likely to go to a familiar hairdresser instead of a new one could be several: the price, service quality, location, and most importantly, lots of communication is needed to transfer your requirements to the new hair dresser accurately, still, the new hairdresser usually gets full understanding of your requirements and remembers them after you have been there several times.

From this we can see a first successful experience would be extremely important to users, as that is the most costless way that a website gains a faithful user. Furthermore, the first impression users get at the very first glance of the interface matters greatly when users choose to stay and explore more details or leave. People nowadays have plenty of options while choosing services online. Similar services are often provided by dozens of suppliers who are always trying to compete with each other.

Aesthetics, or visual appeal, is the first thing users experience with the software system, they determine what kind of first impression users get [Jennings, 2000] and whether users enjoy with that site [Heijden, 2003]. Moreover, with an impressive first image, negative sides of the interface can even be ignored or disregarded [Campbell and Pisterman, 1996]. As a conclusion, first impression does affect a lot on users' final choices.

3 CULTURE

After introducing the changing of UI design emphasis and the importance of aesthetically pleasing and clarity in UI design, let us take a look at how culture influences those aspects.

Researches have shown that culture, as an element in UI design, starts to draw more and more attention from the industry. For example, Marcus and Gould [2001] introduce that Cultures can even differ inside a country. In the Judeo-Christian West, red, blue, white and gold are sacred colours meanwhile in Buddhist it is yellow and in Islamic it is green. These differences can extend deeper than appearance level; they are the presents of different strong cultural values. Starting with this, Marcus and Gould [2001] reviewed Hofstede's [2001] culture dimensions and argues culture does raise many issues in UI design.

3.1 Definition of culture

When we lookup the word "Culture" in Oxford Dictionary, it gives two explanations:

- *"The arts and other manifestations of human intellectual achievement regarded collectively*."
- *"The ideas, customs, and social behaviour of a particular people or society."*

Culture is known as a broad word, to make its definition clearer, some definitions or descriptions are gathered from book *Culture:*

Culture is a common understanding of concepts and definitions. [Kroeber and Kluckhohn, 1952, page 46-47].

Culture is a combination of living methods and related behaviours shared by individuals in a society, for example, habit. [Tylor, 1871]

Culture is a set of life activities which is shared by the group. [Bose, 1929]

Some keywords can be summarized from the above definitions / descriptions: habit, life activities, actions, behaviour, values and think. Culture has a deep and significant influence on people's understanding of values, reaction to things in surrounding

environments and the most importantly, the way of thinking. These influences are strong enough to differ people in different cultures from their preferences towards everything in their daily lives.

3.2 Culture models

From the very beginning of human society, a culture is born to establish a shared knowledge system and use it to help its members to survive as a group as well as providing an environment to enable and develop communication. The sharing of knowledge or patterns enables members in the culture easier to communicated with eachother [Jaime, 2004]. Table 2 shows a famous culture model introduced by Hofstede [2011].

Hofstede Culture Models [2011]
Power Distance
Masculinity vs. Femininity
Individualism vs. Collectivism
Uncertainty Avoidance
Long-Term vs. Short-Term Orientation

Table 2. Hofstede Culture Models.

We choose Hofstede's model and its dimensions to proceed our research since this model is the most well-known model, and it is the model that Reinecke and Abraham [2013] used in their research. In Hofstede's year 2011 update [Hofstede, 2011], which is the most updated one, we find the five dimensions which are related to our research, they are power distance, masculinity vs. femininity, individualism vs. collectivism, uncertainty avoidance and long-Term vs. short-Term Orientation.

According to Hofstede [2011], Power Distance has been defined as the acceptance extent of unequal distributed power in the environment from individuals or organizations. In another word, it can be used to describe how equal the society is. Cultures with low power distance scores usually have more equal society, people are not expecting big differences in power distribution, instead, they live and behave equally to others in the society. In cultures with high power distance scores, the society is not so equal, and people accept it, live with it.

Masculinity versus its opposite, Femininity, is a societal characteristic as well. It explains if a society have more masculine characteristics or feminine characteristics. Masculine characteristics refer to for example, competition, assertiveness. Feminine characteristics refer to for example, modesty, care. It also refers to the difference of male's and female's roles in the society. [Hofstede et al., 1998].

Individualism on the one side versus its opposite, Collectivism, is a societal characteristic again. It measures if a society attach more importance to individual interest or group interest. In individualism societies, connections between individuals or small units are loose, people care more about their own interest rather than the groups'. In collectivism societies, people care more about the big group which contains them. They also make a lot of effort to keep the group more stable and strong. Besides, people are very royal to the groups. [Hofstede, 2011].

Uncertainty Avoidance refers to the extent of a society's tolerance for uncertainty. If a society has high uncertainty avoidance score, it will take actions to deal with the potential uncertainty. Its members will feel uncomfortable or even unsafe while facing uncertain situations. On the other side, a society with low uncertainty avoidance score can accept uncertain situations and face it in a calm way. [Hofstede, 2011].

Long-term and short-term orientation refer to if a society or its members can consider a longer consequence of what is happening. Long-term orientation society has more patients in dealing with potential interests which perhaps will not come up in a long time. Short-term orientation society pays more attention to the interest which can be gained right away. [Hofstede, 2011].

In his year 2001 update [Hofstede, 2001], which is the newest one accessible, we found these five dimensions' indexes for China, Finland and world's average, shown in Figure 3.

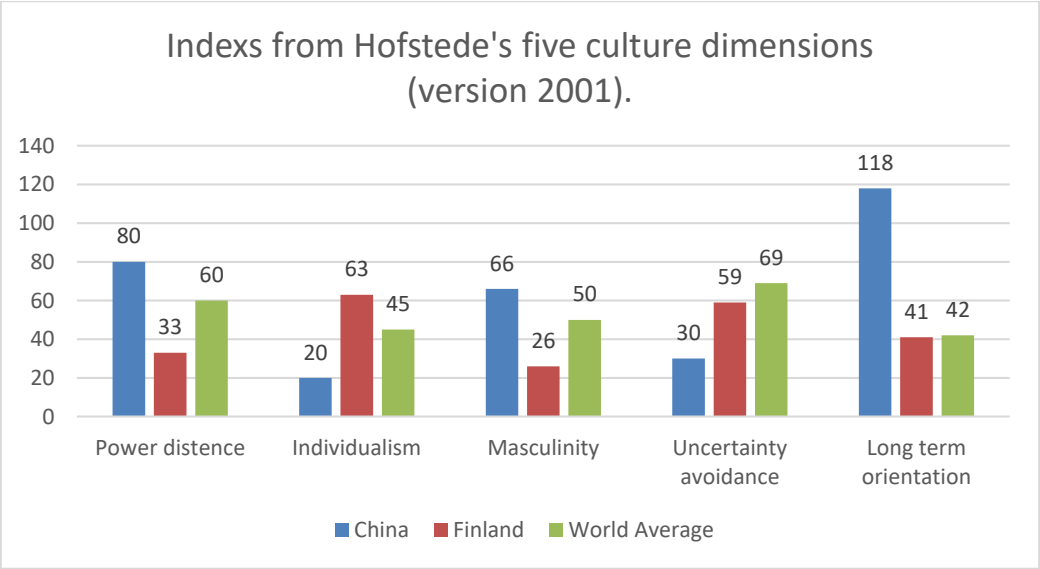

Figure 3. Four Culture Models.

From Figure 3, obviously China and Finland do not share much common values in culture. The dimensions are digitized into scores to describe different behaviours from different cultures. Compared with Finland, Chinese culture is considered to have bigger power distance, lower individualism, more masculinity, lower uncertainty avoidance and a lot more long-term orientation.

3.3 Hofstede's cultural dimensions and UI design principles.

In 2013, Reinecke and Abraham introduced their research on relationships between Hofstede's culture dimensions and user interface design elements. Table 3 shows how UI designs are affected by different performances in five Hofstede culture dimensions [Reinecke and Abraham, 2013, page 431]. The second column is abbreviation of the principle under the certain culture dimension, for example, P1 stands for the first UI design principle under power distance dimension.

The research introduces that some UI design principles can go oppositely if they are applied in different cultures with a low or high score under each Hofstede culture dimension.

Culture with a low power distance score prefers to design UI with: Different access and navigation possibilities (user can easily navigate to other pages) as well as nonlinear navigation (menus are not linearly organized). Not necessarily structured data (data or information arranged and displayed without certain guideline). Most information at

interface level (homepages contains already most useful information). Information is organized hierarchically less deep (access to required information with fewer navigation steps). Friendly error messages providing suggestions about how to proceed the interaction; fewer support options (not much support or assist information from website. Culture with a high distance score does the opposite way.

Culture with a low individualism score prefers to design UI with: containing the culture's traditional colours and images, for instance red and blue for China; big image-to-text ratio; more multimodal; more colourful interface. Culture with a high individualism score does the opposite way.

Culture with a low masculinity score prefers to design UI with little saturation, pastel colours (not so colourful); allowing for exploration (user can easily navigate to other pages) and different options of navigation; content on the interfaces contains personal presentation type of information, making the communication more user friendly. Culture with a high masculinity score does the opposite way.

Culture with a low uncertainty avoidance score prefers to design UI with: most information organized at the very beginning levels of the interface, as well as a relevantly more complex interface; nonlinear navigation; use elements such as colours, typography and sound to encode information. Culture with a high masculinity score does the opposite way.

Culture with a low long term orientation score prefers to design UI with: less density information and content mostly organized into small units. Culture with a high masculinity score does the opposite way.

This thesis, applies the Reinecke and Abraham's model [2013] to analyse the culture dimensions and the affected UI design principles in Finland and China case. By doing this, we will find out the principles that are still effective and the ones lost their effectiveness in this specific case. By keeping the existing effective principles and modifying the invalid ones, this thesis further discusses how Finnish companies' websites can do better localization in the Chinese market. In Section 4.3, some irrelevant aspects are going to be deleted due to the importance and relevance to the study.

In Table 3, the connections between Hofstede's dimensions and UI design elements are introduced by Burgmann [2006], Marcus and Gould [2000, 2001], Voehringer-Kuhnt [2002], Gould [2000], Hermeking [2005], Barber and Badre [1998], Dormann and Chisalita [2002], Ackerman [2002], Callahan [2005], Cha [2005], Choi [2005], Hodemacher [2005], Marcus [2000], Zahed [2001], Baumgartner [2003], Corbitt [2002], Kamentz [2003], Marcus and Baumgartner [2004].

Relationships between Hofstede's Dimensions and UI Design Aspects [Reinecke, Abraham 2011]				
		Low Score	**High Score**	**Reference**
Power Diastanne	P1	Different access and navigation possibilities; nonlinear navigation	Linear navigation, few links, minimize navigation possibilities	[Burgmann et al., 2006] [Marcus and Gould, 2000] [Voehringer-Kuhnt, 2002]
	P2	Data does not have to be structured	Structured data	[Marcus and Gould, 2000]
	P3	Most information at interface level, hierarchy of information less deep	Little information at first level	[Burgmann et al., 2006] [Marcus and Gould, 2000]
	P4	Friendly error messages suggesting how to proceed	Strict error messages	[Marcus and Gould, 2000, 2001]
	P5	Support is only rarely needed	Provide strong support with the help of wizards	[Marcus and Gould, 2000]
	P6	Websites often contain images showing the country's leader or the whole nation	Images show people in their daily activities	[Gould et al., 2000] [Marcus and Gould, 2000]
Individualism	I1	Traditional colours and images	Use colour to encode information	[Marcus and Gould, 2000]
	I2	High image-to-text ratio	High text-to-image ratio	[Gould et al., 2000]
	I3	High multimodality	Low multimodality	[Hermeking, 2005]
	I4	Colourful interface	Monotonously coloured interface	[Barber and Badre, 1998]
Masculinity	M1	Little saturation, pastel colours	Highly contrasting, bright colours	[Dormann and Chisalita, 2002] [Voehringer-Kuhnt, 2002]
	M2	Allow for exploration and different paths to navigate	Restrict navigation possibilities	[Ackerman, 2002]
	M3	Personal presentation of content and friendly communication with the user	Use encouraging words to communicate	[Callahan, 2005] [Dormann and Chisalita, 2002] [Hofstede, 1986]
Uncertainty Avoidance	U1	Most information at interface level, complex interfaces	Organize information hierarchically	[Burgmann et al., 2006] [Cha et al., 2005] [Choi et al., 2005] [Hodemacher et al., 2005] [Marcus, 2000] [Marcus and Gould 2000, 2001] [Zahed et al., 2001]
	U2	Nonlinear navigation	Linear navigation paths / show the position of the user	[Baumgartner, 2003] [Burgmann et al., 2006] [Corbitt et al., 2002] [Kamentz et al., 2003] [Marcus, 2000] [Marcus and Gould, 2000, 2001]
	U3	Code colours, typography and sound to maximize information	Use redundant cues to reduce ambiguity	[Marcus and Gould, 2000, 2001]
Long Term Orientation	L1	Low information density	Most information at first level	[Marcus and Baumgartner, 2004] [Marcus and Gould, 2000]
	L2	Content highly structured into small units	Content can be arranged around a focal area	[Marcus and Gould, 2000]

Table 3. Relationships between Hofstede's Dimensions and UI Design Aspects [Reinecke and Abraham, 2013, page 431].

4 METHODOLOGY

4.1 Method design and tools

As mentioned in earlier, how UI elements are used in different cultures can result specific cultural friendly UI, some elements are translated into a number of indicators. These indicators are used to analyse UI design principle logics will be extracted from the websites, they are listed and introduced in each test under this chapter. The reason of choosing these indicators is they can be used to analyze most of the principles listed in Table 3, besides, they especially have strong connection with aesthetically pleasing and clarity principles, which are introduced as emphasis of UI design principles in recent years.

Since websites are usually big systems, several online tools will help to collect data from the study samples. To cover the aspects from Table 3, a test is carried out and it will be divided into four modules, they are *readability test*, *navigability test*, *colour test* and *sitemap test*.

In readability test, we will collect data indicators: sentences, words, average words, per sentence, average words per page and images. These indicators are related to principles P3, I2, U1, L1 in Table 3.

In navigability test, we will collect data indicators: percentage connected (%), hub pages and leaf pages. These indicators are related to principles P1, P3, M2, U1, L1 in Table 3.

In colour test, we will collect data indicators: elements detected, luminosity contrast (failures), brightness difference (failures), colour difference (failures), and total number of colours. These indicators are related to principles I1, I2, I4, M1 in Table 3.

In sitemap test, we will collect study sample's visualized sitemaps, P3 from Table 3 is the related principle.

Detailed explanations of the tests and indicators will be introduced in the following subsections.

4.1.1 **Readability test**

With help from Nibbler [2018] and Juicystudio [2018], several indicators are tested with the study samples. They are: a) Sentences, number of sentences of homepage. b) Words, number of words of homepage. c) Average Words Per Sentence, average words per sentence on the homepage. d) Average Words Per Page, average words on each page under the domain except posts. e) Images, number of images on homepage. Indicator d) is collected by Nibbler [2018], indicators a), b), c) are collected from homepages by Juicystudio [2018], indicator e) is collected from homepages manually. The relevant principles from Table 3 are P3, I2, U1 and L1.

Juicystudio is a UK website run by Gez Lemon. The aim of the website is to help developers practise and examine their work in this fast developing age. As one of the functions from Juicystudio, readability test is very helpful in determining how readable the content is. Unfortunately, after contacting the author of Juicystudio and testing these two tools on several test-use websites designed for this test, a common principle is found on the tools: words are counted when there is a tag * *, sentences are counted when there are tags * and *. Technically speaking all the test results are only valid when the website is using Latin languages, Chinese is definitely not Latin. As a consequence, we are not able to use these results to compare between China and Finland, but we can still use them to analyse the situation of one country. This will be explained more in the analyse part of this chapter.

Nibbler is a free tool for testing websites, its key value is providing reports scoring the website in several main aspects, such as accessibility, search engine optimization, social media and technology.

4.1.2 **Navigability test**

With help from Datayze [2018], several indicators are tested with the study samples. They are: percentage connected, hub pages and leaf pages.

Datayze [2018] is a data & statistics app company providing different applications for analysing. In this test, Navigability Analyser uses spider to crawl the website needed to be tested and analysing its navigability. Spider calculates the shortest path from splash page or homepage to any internal page such as blog post, the overall connectivity of a website, highly connected hubs and destination leaf nodes.

Percentage Connected [Datayze, 2018] refers to the percentage of actual links between any two pages to possible links. A website with 45 pages has maximum 2025 of unique, directional links between them. Hub Pages [Datayze, 2018] are popularly connected pages which can lead users to a number of other pages in order to increase site navigability, however, they may not contain much information. In this test, Datayze is requested to count the number of pages which have unique inbound links (we can also call them references) from more than 10 percent (this percentage can be modified before running the test if needed) of the pages out of total, this number is the number of hub pages. Leafs Pages [Datayze, 2018], on the other hand, are often pages with a lot concrete content. Users might only be able to navigate to other pages from many or footer. Besides, the navigability is mostly limited. In this test, all pages having no more than 5 internal links (this number can be modified before running the test as well) are counted as leaf pages.

4.1.3 Colour test

With help from Checkmycolours [2018] and Color combos [2018], several indicators are tested with the study samples. They are: Elements detected, luminosity contrast (failures), brightness difference (failures), colour difference (failures) and total number of colours.

Checkmycolours [2018] is a tool which checks all Document Object Model (DOM) elements and collects their foreground and background colour information to see if they have a significant contrast or not. All the tests are designed according to the algorithms suggested by the World Wide Web Consortium (W3C) [W3C, 2018], these algorithms will be introduced in the following paragraphs.

Color combos [2018] analyses colours on websites, here it is used to grab all colour elements from CSS or HTML files and present them in Hex format.

According to guideline 1.4 “Make it easier for users to see and hear content including separating foreground from background” in Web Content Accessibility Guidelines 2.0 (WCAG 2.0) [W3C, 2018], Luminosity Contrast Ratio is defined as:

“(L1+.05) / (L2+.05) where L is luminosity and is defined as .2126*R + .7152*G + .0722*B using linearized R, G, and B values. Linearized R (for example) = (R/FS) ^ 2.2 where FS is full scale value (255 for 8-bit colour channels). L1 is the higher value

(of text or background) and L2 is the lower value. Text or diagrams and their background must have a luminosity contrast ratio of at least 4.5:1 for level 2 conformance to guideline 1.4.3, and at least 7:1 for level 3 conformance to guideline 1.4.6." We can simply understand it as how big is the general luminosity contrast a website has.

According to Web Content Accessibility Guidelines 1.0 (WCAG 1.0) [W3C, 2018], colour brightness is defined as:

"((Red value * 299) + (Green value * 587) + (Blue value * 114)) / 1000"

This algorithm is used for converting RGB values to YIQ values. YIQ is colour space used by NTSC colour TV system, Y represents luminance information meanwhile IQ represents chroma information. This brightness value shows a perceived brightness for a colour, in this test, 125 is set as the pass line of good colour brightness difference between foreground and background.

Colour difference is defined in the following formula [Checkmycolours 2018]: "(maximum (Red value 1, Red value 2) - minimum (Red value 1, Red value 2)) + (maximum (Green value 1, Green value 2) - minimum (Green value 1, Green value 2)) + (maximum (Blue value 1, Blue value 2) - minimum (Blue value 1, Blue value 2))." To verify if the foreground and background elements have a good colour difference, 500 is set as the pass line. Simply speaking this indicator shows does a website pushing out information by using high contrast colours between foreground and background.

Total number of colours stands for all colour possibilities detected in the website. In Table 19 from Appendix 3, the Failures are counted among the elements detected. Five indicators about colour are tested, with results shown in Table 19 from Appendix 3.

4.1.4 **Sitemap test**

With the help of Visual Site Mapper [2018], we created six pairs of diagrams showing six pairs websites' visualized sitemaps. Food and Education websites' sitemaps cannot be generated with this tool so we are not able to show them here. Otherwise the results are displayed in Figure 4 to Figure 9 in Appendix 4. In each sitemap diagram, the left side shows Chinese website's sitemap while the right side shows Finnish one. In all those sitemaps, up to 200 top pages are shown as coloured dots in the diagrams, the

bigger dots with hover texts represents homepages. By visualizing the study samples' site maps, we can easily tell those websites' structures and how they possibly arrange information.

4.2 Study sample

To apply Reinecke and Abraham's research results in studying the website design in Finland and China, two groups of websites are selected and they are listed in Table 4, along with a category. This category is designed for choosing proper study samples which can represent most of the websites facing potential Chinese visitors. Food, Tourism, Gaming, Travel, Education and Electronic Brands are some of the most popular products that Finland could export to other countries including China. News websites and Online Shopping websites collects data while receiving big amount of visitors every day, so their UI designs refer certain information of visitors' *behaviour*, *habits* (key words from definitions of culture in Subsection 2.2.2) and interests from these two countries. Behind categories are typical representatives' URLs.

Since it will be a huge project to examine each page of every study sample, also the tool is limited to examine 1000 URLs per day for each user, all the data except in the row Electronics Brands is collected from 100 random pages from each study sample. In row Electronics Brands, this Chinese company Xiaomi has only 40 pages on their website so data is collected only from 40 pages.

Websites collected from China and Finland		
Type	China	Finland
News	http://news.163.com/	https://yle.fi/
Food	https://www.zhouheiya.cn/	http://www.fazer.com/
Tourism	http://vacations.ctrip.com/	http://www.visitfinland.fi/
Gaming	http://game.qq.com/	http://www.rovio.com/
Travel	http://www.airchina.com.cn/	https://www.flysas.com/fi/fi/
Education	http://en.whu.edu.cn/	http://www.uta.fi/
Electronics Brands	https://www.mi.com/	https://jolla.com/
Online Shopping	https://www.jd.com/index.html	https://www.verkkokauppa.com/

Table 4. Study samples.

5 RESULTS AND ANALYSE

Based on the four tests done in Chapter 4, results are displayed in Appendix 1-4. Analyse is carried out to examine whether connections between Hofstede's dimensions and UI design elements from Reinecke are applicable for the UI design of websites in Finland and China. In following subsections, as mentioned in Section 2.3, some aspects from Table 3 are deleted, this analyse is going to focus on those aspects more business / promotion relevant. Besides, related UI design principles from Bhaskar et al. [2011], will be attached with related aspects.

5.1 Power distance

Table 5 lists the aspects from power distance dimension that are examined.

	Low Score (Finland)	**High Score (China)**	**UI Design Principles in 2011 Model**
Power Diastanne	Different access and navigation possibilities	Few links, minimize navigation possibilities	2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity
	Most information at interface level	Little information at first level	2. Clarity 9. Efficiency 16. Simplicity
	Hierarchy of information less deep	Hierarchy of information more deep	2. Clarity 8. Directness 9. Efficiency

Table 5. UI design aspects under power distance dimension by Reinecke [Reinecke and Abraham, 2013, page 431].

According to Hofstede's update in 2001, China scored 80, Finland scored 33, World average scored 60 in Power Distance Dimension. Which means, significantly China is a high power distance country while Finland is a low power distance country compared with world's average.

5.1.1 Different access and navigation possibilities VS. Few links, minimize navigation possibilities.

Country	**China**	**Finland**	**China**	**Finland**	**China**	**Finland**
Indicators / Type	Percentage Connected(%)		Hub Pages		Leaf pages	
News	1,64	11,21	1,00	82,00	77,00	26,00
Food	6,31	5,27	45,00	58,00	30,00	76,00
Tourism	623,67	369,39	11,00	4,00	2,00	3,00
Gaming	11,79	28,30	60,00	82,00	27,00	20,00
Travel	71,45	39,13	89,00	9,00	6,00	14,00
Education	50,52	64,28	93,00	84,00	3,00	10,00
Electronics Brands (Chinese site out of 40 pages)	53,78	8,01	14,00 (35,00)	20,00	22,00 (55,00)	24,00
Online Shopping	130,58	57,03	8,00	97,00	3,00	3,00
Average	**54,07**	**34,66**	**41,33**	**55,83**	**20,67**	**16,17**

Table 6. Different access and navigation possibilities VS. Few links, minimize navigation possibilities.

In Table 6, with data fetched from navigability test, the average percentage of pages connected, the number of hub pages and leaf pages are calculated after removing the maximum and minimum result (marked in red colour) from each country. Data in the parentheses are scaled to a sample size 100.

A 19.5 percentage difference is detected on the average percentage of pages connected. However, different from Reinecke, the result shows Chinese websites have stronger navigation possibilities than Finnish websites. Under number of hub pages' indicator, a Finnish website has averagely 14.5 more hub pages than a Chinese website. Horizontally, in five out of eight types, Chinese websites have stronger navigation possibilities, although the difference is not so distinguished.

So generally speaking, compared with the huge difference between China and Finland in performances in power distance dimension, navigability seems to not rely much on power distance.

Similarly, there is no significant difference on Chinese and Finnish study samples' navigability.

5.1.2 Most information at first level VS. Little information at interface level

Country	China			Finland		
Indicators / Type	Words on Homepage	Avergae Words per Page	Words on Homepage /Average Words per Page	Words on Homepage	Average Words per Page	Words on Homepage /Average Words per Page
News	2431	417	5,83	1320	610	2,16
Food	339	73	4,64	439	247	1,78
Tourism	749	494	1,52	1170	386	3,03
Gaming	460	84	5,48	737	543	1,36
Travel	1764	215	8,20	745	301	2,48
Education	625	173	3,61	753	259	2,91
Electronics Brands	1038	583	1,78	151	558	0,27
Online Shopping	901	123	7,33	1547	565	2,74
Average	/	/	**4,78**	/	/	**2,24**

Table 7. Most information at first level VS. Little information at interface level.

Table 7 shows a comparison with data fetched from readability test. As mentioned in Subsection 4.1.1, we are not able to compare for example food websites' numbers of average words per page between Finland and China. Horizontally, he only information valid is after comparing two indicators, *Words on Homepage* and *Average Words per Page*, it is shown that only one website, verkkokauppa.com, among all sixteen study samples, has more or even most text content on subpages instead of its homepage. Otherwise, fifteen out of sixteen websites have more text content on homepage level.

Instead, vertically, a new indicator named *Words on Homepage/Average Words per Page* is created and displayed at the last column of each country by dividing *Words on Homepage* by *Average Words per Page*. After removing the maximum and minimum result (marked in red colour) from each country's test results, two average numbers show that in both Finland and China, websites generally display more information at first level. More importantly, although China has a much higher index in power distance, Chinese websites are more likely to provide more information on the first level page than Finnish ones. Again, the result goes against Reinecke's introduction.

5.1.3 Hierarchy of information less deep VS. Hierarchy of information more deep

Sitemaps displayed in Figure 4 to Figure 9 in Appendix 4 tell if a website is having more or less deep hierarchy of information. As introduced, small coloured dots represent subpages and big dot represents homepage, if there is a gray line connecting any two of the dots, it means they are connected with one internal link. According to this, if a sitemap contains a very centralized diagram of few central dots or even only one, we can tell this website has less deep hierarchy of information since most information can be reached through very few clicks. On the other hand, if a sitemap contains a diagram of more relatively distributed smaller central areas with their own central dots, this website has more deep hierarchy of information since user might need more clicks to reach the target information.

In this case, all the news, tourism and online shopping websites have only one big centralized area surrounding homepage dots, these websites are considered as having less deep hierarchy of information. For gaming websites, with only one significant centralized area, game.qq.com is having less deep hierarchy of information than rovio.com, which has three distributed central areas. For travel websites, similar with gaming websites, airchina.com.cn has only one significant centralized area while flysas.com has two big ones, Finnish website has more deep hierarchy of information. For electronic brands category, mi.com has two centralized areas meanwhile jolla.com has three, the same conclusion as gaming and travel websites.

As a conclusion, although half of the website categories have similar performance at less or more deep hierarchy of information, other half shows Chinese websites do have less deep hierarchy of information than Finnish websites. This conclusion goes against Reinecke's introduction as well.

5.2 Individualism

Table 8 lists the aspects from individualism dimension that are examined.

	Low Score (China)	High Score (Finland)	UI Design Principles in 2011 Model
Individualism	Traditional colours and images	Use colour to encode information	1. Aesthetically Pleasing 2. Clarity 4. Comprehensibility
	High image-to-text ratio	High text-to-image ratio	1. Aesthetically Pleasing 2. Clarity 4. Comprehensibility
	Colourful interface	Monotonously coloured interface	1. Aesthetically Pleasing 2. Clarity

Table 8. UI design aspects under individualism dimension by Reinecke [Reinecke and Abraham, 2013, page 431].

According to Hofstede's update in 2001, China scored 20, Finland scored 63, World average scored 45 in Individualism Dimension. Which means, significantly China is a collectivism country while Finland is an individualism country compared with world's average.

5.2.1 Traditional colours and images VS. Use colour to encode information.

In this comparison, the title can be explained as few colour and image elements VS. diversity in using colours and images.

Indicators	**Colours**		**Images (Only from Homepage)**	
Type / Country	**China**	**Finland**	**China**	**Finland**
News	104,00	43,00	97,00	106,00
Food	46,00	57,00	5,00	16,00
Tourism	10,00	14,00	64,00	23,00
Gaming	55,00	4,00	3,00	9,00
Travel	112,00	22,00	57,00	4,00
Education	27,00	115,00	36,00	8,00
Electronics Brands	10,00	15,00	20,00	25,00
Online Shopping	40,00	3,00	20,00	77,00
Average	**48,33**	**25,83**	**33,67**	**26,33**

Table 9. Traditional colours and images VS. Use colour to encode information.

Table 9 shows colour possibilities and images (only from homepage) found in sixteen study samples, data is fetched from colour test and readability test. Average data is also given after removing the maximum and minimum result (marked in red colour) from each country's test result. According to the average data, Chinese study samples almost double the number of colour used than Finnish study samples, they also use 28% more images on homepages to encode more information towards users. The result again goes against Reinecke's introduction.

Table 9 and its analyse also shows Chinese websites use two times number of colours to present information than Finnish websites. So the result corresponds Reinecke's introduction.

5.2.2 High image-to-text ratio VS. High text-to-image ratio

Country	**China**			**Finland**		
Type / Indicators	**Sentences**	**Images**	**Sentences / Images**	**Sentences**	**Images**	**Sentences / Images**
News	1390	97	14.33	239	106	2.25
Food	178	5	35.60	233	16	14.56
Tourism	171	64	2.67	409	23	17.78
Gaming	363	3	121	276	9	30.67
Travel	889	57	15.60	268	4	67.00
Education	209	36	5.81	239	8	29.88
Electronics Brands	463	20	23.15	20	25	0.80
Online Shopping	489	20	24.45	570	77	7.40
Average	/	/	**19.82**	/	/	**17,09**

Table 10. High image-to-text ratio VS. High text-to-image ratio.

In Table 10, two indicators' data, *sentences on homepage* and *images on homepage* is fetched from readability test. A third indicator, *sentences/images* is inserted based on that. Average data calculated after removing the maximum and minimum result (marked in red colour) from each country's test result. Chinese study samples have average image-to-text of 1:19,82 meanwhile Finnish study samples have average 1:17,09. In this comparison China has a higher text-to-image ratio than Finland, although the difference is not so big, the result goes against Reinecke's introduction.

5.3 Masculinity

Table 11 lists the aspects from masculinity dimension that are examined.

	Low Score (Finland)	High Score (China)	UI Design Principles in 2011 Model
Masculinity	Little saturation, pastel colours	Highly contrasting, bright colours	1. Aesthetically Pleasing 2. Clarity
	Allow for exploration and different paths to navigate	Restrict navigation possibilities	2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity

Table 11. UI design aspects under masculinity dimension by Reinecke [Reinecke and Abraham, 2013, page 431].

According to Hofstede's update in 2001, China scored 66, Finland scored 26, World average scored 50 in Masculinity Dimension. Similar with a lot other Asian countries, China is considered as a masculinity country while Finland is known as a Feminist country.

5.3.1 Little saturation, pastel colours VS. Highly contrasting, bright colours

In Table 12 and 13, by calculating the percentage of low luminosity contrast, low colour brightness difference and low colour difference DOM elements and their averages, it is noticed that Chinese study samples use more high luminosity contrast and high colour brightness difference DOM elements than Finnish study samples. As for colour difference, Chinese study samples are not much behind Finnish study samples. In other words, Chinese websites present high contrast and bright interfaces although maybe not so colourful in general. Results meet Reinecke's introduction.

Country	**China**						
Type/ Indicators	**All**	**L**	**L/All %**	**B**	**B/All %**	**C**	**C/ALL %**
News	2133	447	20,96 %	447	20,96 %	554	25,97 %
Food	302	38	12,58 %	19	6,29 %	64	21,19 %
Tourism	1116	314	28,14 %	276	24,73 %	663	59,41 %
Gaming	120	41	34,17 %	49	40,83 %	68	56,67 %
Travel	1103	195	17,68 %	194	17,59 %	412	37,35 %
Education	452	83	18,36 %	77	17,04 %	160	35,40 %
Electronics Brands	72	43	59,72 %	17	23,61 %	66	91,67 %
Online Shopping	362	59	16,30 %	56	15,47 %	347	95,86 %
Average	/	/	**22,60 %**	/	**19,90 %**	/	**51,08 %**

Table 12. Little saturation, pastel colours VS. Highly contrasting, bright colours, China. (All) = number of DOM elements detected, (L) = number of low luminosity contrast DOM elements, (B) = low colour brightness difference DOM elements, (C) = low colour difference DOM elements.

Country	**Finland**						
Type/ Indicators	**All**	**L**	**L/All %**	**B**	**B/All %**	**C**	**C/ALL %**
News	1344	835	62,13 %	772	57,44 %	875	65,10 %
Food	533	90	16,89 %	20	3,75 %	116	21,76 %
Tourism	687	299	43,52 %	299	43,52 %	523	76,13 %
Gaming	658	82	12,46 %	70	10,64 %	82	12,46 %
Travel	382	160	41,88 %	147	38,48 %	279	73,04 %
Education	676	240	35,50 %	179	26,48 %	263	38,91 %
Electronics Brands	728	123	16,90 %	133	18,27 %	133	18,27 %
Online Shopping	1209	605	50,04 %	605	50,04 %	605	50,04 %
Average	/	/	**34,12 %**	/	**31,24 %**	/	**44,52 %**

Table 13. Little saturation, pastel colours VS. Highly contrasting, bright colours, Finland. (All) = number of DOM elements detected, (L) = number of low luminosity contrast DOM elements, (B) = low colour brightness difference DOM elements, (C) = low colour difference DOM elements.

5.4 Uncertainty Avoidance

Table 14 lists the aspects from uncertainty avoidance dimension that are examined.

	Low Score (China)	High Score (Finland)	UI Design Principles in 2011 Model
Uncertainty Avoidance	Most information at interface level, complex interfaces	Organize information hierarchically	2. Clarity 8. Directness 9. Efficiency 16. Simplicity

Table 14. UI design aspects under uncertainty avoidance dimension by Reinecke [Reinecke and Abraham, 2013, page 431].

According to Hofstede's update in 2001, China scored 30, Finland scored 59, World average scored 69 in Uncertainty Avoidance Dimension. For the first and only time, China and Finland stand on the same side below world's average score. But still, compared with Chinese, Finnish people are more likely to avoid uncertainties. My working experience in a company having both Chinese and Finnish employees tells that the difference can truly cause problems.

Same with the analyse in Subsection 4.3.1, Chinese websites are more likely to provide more information on the first level page than Finnish ones. The result match Reinecke's introduction's introduction. However, interesting thing is, with power distance dimension, Reinecke argues interfaces from high score cultures have less information at interface level; with uncertainty avoidance dimension, Reinecke argues interfaces from low score cultures have most information at interface level. But China scores high in power distance and low in uncertainty avoidance.

5.5 Long term orientation

Table 15 lists the aspects from long term orientation dimension that are examined.

Long Term Orientation	Low Score (Finland)	High Score (China)	UI Design Principles in 2011 Model
	Low information density	Most information at first level	2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity

Table 15. UI design aspects under long term organization dimension by Reinecke [Reinecke and Abraham, 2013, page 431].

According to Hofstede's update in 2001, China scored 118, Finland scored 41, World average scored 42 in Long Term Orientation Dimension. In this dimension, China ranks top one in the world with score 118, Finland, on the other hand, hovers around world average.

Same with the analyse in Subsection 4.3.1 and 4.3.4, Chinese websites are more likely to provide more information on the first level page than Finnish ones. Result here meets Reinecke's introduction.

6 DISCUSSION

After analysing the results from four tests, we got a comparison between Table 3 and Table 16.

Four out of ten UI design aspects (in regular font) under different Hofstede culture dimensions been examined correspond Reinecke's research. They are: Colourful interface vs. Monotonously coloured interface; Little saturation, pastel colours vs. Highly contrasting, bright colours; Most information at interface level, complex interfaces vs. Organize information hierarchically; Low information density vs. Most information at first level.

Two out of ten UI design aspects have no significant relations with Hofstede's culture dimensions. There is no significant difference in access and navigation possibilities, no significant difference in access and navigation possibilities.

The rest four go against Reinecke's research: Little information at first level vs. Most information at interface level; Hierarchy of information more deep vs. Hierarchy of information less deep; Use colour to encode information vs. Traditional colours and images and High text-to-image ratio vs. High image-to-text ratio.

For an introduction which has to cover performances of most major cultures in the world, I would say Reinecke and Abraham [2013] carried out a good example of how we shall bring culture elements into UI design. Besides, generally it is already convincing, there is no one hundred percent accurate universal formula. Regarding the four aspects (in bold font) which do not correspond Reinecke's research, they are introduced under Power Distance, Individualism and Masculinity Dimensions.

In this thesis, when there are only China and Finland been re-examined and compared under connections between Hofstede's culture dimensions and UI design elements, some aspects are discovered performing differently with Reinecke and Abraham [2013]. Other cultures might also have different performances with Reinecke and Abraham [2013].

UI elements, as the most basic units of a UI, can be used differently in different cultures, each culture has its own preferred consist of UI elements use. This is how cultural-friendly user interfaces come from.

Relationships between Hofstede's Dimensions and UI Design Aspects Between China and Finland.			
	Low Score	**High Score**	**UI Design Principles in 2011 Model**
Power Diastanne	**No significant difference in access and navigation possibilities**		2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity
	Little information at first level	**Most information at interface level**	2. Clarity 9. Efficiency 16. Simplicity
	Hierarchy of information more deep	**Hierarchy of information less deep**	2. Clarity 9. Efficiency 16. Simplicity
Individualism	**Use colour to encode information**	**Traditional colours and images**	1. Aesthetically Pleasing 2. Clarity 4. Comprehensibility
	High text-to-image ratio	**High image-to-text ratio**	1. Aesthetically Pleasing 2. Clarity 4. Comprehensibility
	Colourful interface	Monotonously coloured interface	1. Aesthetically Pleasing 2. Clarity
Masculinity	Little saturation, pastel colours	Highly contrasting, bright colours	1. Aesthetically Pleasing 2. Clarity
	No significant difference in access and navigation possibilities		2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity
Uncertainty Avoidance	Most information at interface level, complex interfaces	Organize information hierarchically	2. Clarity 8. Directness 9. Efficiency 16. Simplicity
Long Term Orientation	Low information density	Most information at first level	2. Clarity 7. Control 8. Directness 9. Efficiency 16. Simplicity

Table 16. Relationships between Hofstede's Dimensions and UI Design Aspects Between China and Finland.

7 CONCLUSION

Although some different aspects are introduced against Reinecke's introduction from this thesis, it is not changing the fact that culture differences do influence UI design aspects between China and Finland. From the fourth column of Table 16, seven principles from 2011 Model are seen behind the UI design aspects been examined. They are: aesthetically Pleasing, clarity, comprehensibility, control, directness, efficiency, simplicitly.

For Finnish companies who wish to create better localized websites facing Chinese users, based on this thesis, they need to pay attention to the culture differences especially at power distance, individualism and masculinity differences between Finland and China. If they wish the user interfaces to be more "Chinese", improvements can be done by:

- Organize more information at interface level. Key information shall mostly be displayed on homepages. Users can have access to them without much clicks. If key information is placed in inner pages, users might be too lazy to navigate to it.
- Organize less deep hierarchy of information. Construct the website with a simpler structure in order to organize less deep hierarchy of information. Users can have access to useful information with few clicks.
- Use bigger selection of colours to encode information. Colourful interfaces are more popular in China. More colours can be used to integrate different information. For example, different colours help to create high contrast.
- Use more texts than images to display information. Chinese websites prefer to encode information with texts than images.

Based on the case study and conclusion in this thesis, we are now able to give out several suggestions to the industry, however, when we look at the beginning part of this thesis it reminds us that things are always changing, UI design principles are updating as well. For instance, for now we can still suggest Finnish companies to use more texts than images to display information on their Chinese version websites, we perhaps will suggest the opposite way not far in the future. Things at this age is changing more rapidly than ever, we will have to keep ourselves updated in order to be a qualified software engineer.

This thesis also has limitations, for example, the number of study samples is too small, the results could be more precise if we can analyse more samples.

REFERENCES

[Ackerman, 2002] Ackerman, S. 2002. Mapping User Interface Design to Culture Dimensions. *In Proceedings of the International Workshop on Internationalization of Products and Systems (IWIPS'02).*

[Baumgartner 2003] Baumgartner, V.-J. 2003. Thesis: A Practical Set of Cultural Dimensions for Global User-Interface Analysis and Design. Fachhochschulstudiengang Informations-Design.

[Barber and Badre 1998] Barber, W., and Badre, A. 1998. Culturability: The Merging of Culture and Usability. *Fourth Conference on Human Factors and the Web, Basking Ridge*. Available at: http://zing.ncsl.nist.gov/hfweb/att4/proceedings/barber/ Consultado en agosto del 2010. Accessed 05.2018.

[Bhaskar et al., 2011] N. Uday Bhaskar, P. Prathap Naidu, S.R. Ravi Chandra Babu, P.Govindarajulu, 2011. General Principles of User Interface Design and Websites. *International Journal of Software Engineering (IJSE)*, vol. 2, no. 3, pp. 45-60.

[Bose, 1929] Bose, N. K. 1929, *Cultural Anthropology*. Indian Associated Publishing Company, Limited.

[Burnham et al., 2003] Burnham, T.A., Frels, J.K., and Mahajan V., 2003. Consumer switching costs: a typology, antecedents, and consequences. *Journal of the Academy of Marketing Science*, Vol: 31 issue: 2, page(s): 109-126.

[Burgmann et al, 2006] Burgmann, I., Kitchen, P., and Williams, R. 2006. *Does Culture Matter on the Web?* Marketing Intelligence & Planning.

[Callahan, 2005] Callahan, E. 2005. Cultural Similarities and Differences in the Design of University Websites. *Journal of Computer-Mediated Communication*, Vol 11, Issue 1, Pages 239–273.

[Campbell and Pisterman, 1996] Campbell, A. and Pisterman, S., 1996. A Fitting Approach to Interactive Service Design, The Importance of Emotional Needs. *Design Management Journal*, Pages 10–14.

[Cha et al. 2005] Cha, H., Oshlyansky, L., and Cairns, P. 2005. Mobile Phone Preferences and Values: The U.K. vs. Korea. *In Proceedings of the International Workshop on Internationalization of Products and Systems (IWIPS).* Day, D.L., Evers, V. & E. del Galdo. Designing for Global Markets 7, 29-41. 7th International Workshop on Internationalization of Products and Systems. Amsterdam, The Netherlands.

[Checkmycolours, 2018] Checkmycolours, color elements scan tool, http://www.checkmycolours.com Accessed 05.2018.

[Choi et al. 2005] Choi, B., Lee, I., Kim, J., and Jeon, Y. 2005. A Qualitative Cross-National Study of Cultural Influences on Mobile Data Service Design. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Pages 661-670.

[Color combos, 2018] Color combos, color elements scan tool, https://www.colorcombos.com/combotester.html Accessed 05.2018.

[Corbitt et al. 2002] Corbitt B, Thanasankit T. A model for culturally informed web interfaces[M]//Internet management issues: a global perspective. IGI Global, 2002: 1-26.

[Datayze, 2018]Datayze, data drivenapps, https://datayze.com Accessed 05.2018.

[Dormann and Chisalita, 2002] Dormann, C., and Chisalita, C. 2002. Cultural Values in Web Site Design. *Journal of Computer-Mediated Communication*, Vol 11, Issue 1, Pages 239–273.

[Fornell, 1992] Fornell, C., 1992. A national customer satisfaction barometer: The Swedish experience. *Journal of Marketing*, Vol. 56, No. 1, pp. 6-21.

[Galitz, 2007] Wilbert O. Galitz, 2007. *The Essential Guide to User Interface Design, Second Edition*, Wiley India Edition.

[Gould et al. 2000] Gould, E., Zakaria, N., and Yusof, S. 2000. Applying Culture to Website Design: A Comparison of Malaysian and US Websites, *Professional Communication Conference*, 2000. *Proceedings of 2000 Joint IEEE International and 18th Annual Conference on Computer Documentation* (IPCC/SIGDOC).

[Hall, 1959] Hall, E., 1959. *The Silent Language*. Doubleday.

[Heijden, 2003] Van Der Heijden, H., 2003, Factors influencing the usage of websites: The case of a generic portal in the Netherlands. *Information & Management*, Vol. 40, Issue 6, Pages 541-549.

[Hermeking 2005] Hermeking, M. 2005. Culture and Internet Consumption: Contributions from Cross-Cultural Marketing and Advertising Research, *Journal of Computer-Mediated Communication*. Vol 11, Issue 1, Pages 192–216.

[Hodemacher et al. 2005] Hodemacher, D., Jarman, F., and Mandle, T. 2005. Kultur und Web-Design: Ein Empirischer Vergleich Zwischen Grossbritannien und Deutschland. *In Proceedings of the Conference Mensch und Computer 2005*. Kunst und Wissenschaft, Grenzilberschreitungen der interaktiven, Art. Pages 93-101.

[Hofstede, 1986] Hofstede, G. 1986. Cultural Differences in Teaching and Learning. *International Journal of Intercultural Relations*. Vol 10, Issue 3, Pages 301-320.

[Hofstede, 2001] Hofstede, G., 2001. *Culture's consequences* (2nd ed.), Sage Publications.

[Hofstede, 2011] Hofstede, G., 2011. Dimensionalizing Cultures: The Hofstede Model in Context. *Online Readings in Psychology and Culture*, 2(1). https://doi.org/10.9707/2307-0919.1014 Accessed 05.2018.

[Hofstede et al., 1998] Hofstede, G. with Arrindell, W. A., Best, D. L., de Mooij, M. Hoppe, M. H., van de Vliert, E., van Rossum, J. H. A., Verweij, J., Vunderink, M. & Williams, J. E., 1998. *Masculinity and Femininity: The taboo dimension of national cultures*. Thousand Oaks, CA: Sage.

[Jacob, 2003] Robert J. K. Jacob, 2003. User interface. *Encyclopedia of Computer Science* (4th ed.). John Wiley and Sons Ltd., Chichester, UK 1821-1826.

[Jaime, 2004] Taylor D B. *Toward Multiculturalism: A Reader in Multicultural Edition*, JS Wurzel (Ed.). Intercultural Resource Corporation, Boston (2004) [J]. 2006.

[Jennings, 2000] Jennings, M., 2000. Theory and models for creating engaging and immersive ecommerce Websites. *Proceedings of the 2000 ACM SIGCPR conference on Computer personnel research*, Pages 77-85.

[Juicystudio, 2018] Juicystudio, http://juicystudio.com Accessed 05.2018.

[Kamentz et al. 2003] Kamentz, E., and Womser-Hacker, C. 2003. Defining Culture-Bound User Characteristics as a Starting-Point for the Design of Adaptive Learning Systems. *Journal of Universal Computer Science*, vol. 9, no. 7. Pages 596-607.

[Kralisch, 2006] Kralisch A. The impact of culture and language on the use of the Internet: Empirical analyses of behaviour and attitudes[J], 2006. Unpublished doctoral dissertation, Humboldt-University, Berlin.

[Kroeber and Kluckhohn, 1952, page 46-47] Kroeber, A. L., & Kluckhohn, C., 1952. *Culture: a critical review of concepts and definitions*. Papers. Peabody Museum of Archaeology & Ethnology, Harvard University, 47(1), viii, 223.

[Leonard, 1996] Theo Mandel, *The Elements of User Interface Design*, 1997. © John Wiley & Sons.

[Mandel, 1997] Theo Mandel, 1997. *The elements of user interface design*, John Wiley & Sons, Inc., New York, NY.

[Marcus, 2001] Cross-cultural User-Interface Design, 2001. *Human-Computer Interface International*, Vol. 2, pp. 502-505, Gavriel Salvendy.

[Marcus and Gould, 2000] Marcus, A. 2000. International and Intercultural User Interfaces, *User Interfaces for All: Concepts, Methods, and Tools*, C. Stephanidis (ed.), Hillsdale, NJ: Lawrence Erlbaum Associates.

[Marcus and Gould, 2001] Aaron Marcus, Emilie W. Gould, 2001. Cultural Dimensions and Global Web Design: What? So What? Now What? Aaron Marcus and Associates, Inc. [online database], www.Amanda.com. Accessed 05.2018.

[Marcus and Baumgartner, 2004] Marcus, A., and Baumgartner, V.-J. 2004. A Practical Set of Culture Dimensions for Global User-Interface Development. In: Masoodian M., Jones S., Rogers B. (eds) *Computer Human Interaction*. APCHI 2004. Lecture Notes in Computer Science, vol 3101. Springer, Berlin, Heidelberg.

[Murray and Häubl, 2007] Murray, K.B. and Häubl, G., 2007. Explaining cognitive lock-in: the role of skill-based habits of use in consumer choice. *Journal of Consumer Research*, Vol 34, Issue 1, Pages 77–88.

[Nibbler, 2018] Nibbler, http://nibbler.silktide.com Accessed 05.2018.

[Oppermann, 2002] Reinhard Oppermann, 2002. User-interface Design. *International Handbooks on Information Systems*. GMD Forschungszentrum Informationstechnik.

[Reinecke and Abraham, 2013, page 431] Reinecke Katharina, Bernstein Abraham, 2013. Knowing what a user likes: A design science approach to interfaces that automatically adapt to culture. *MIS Quarterly*, Vol. 37 No. 2, pp. 427-453.

[Statista, 2017] Statista, accessed 20.10.2017. Available as: https://www.statista.com/statistics/262946/share-of-the-most-common-languages-on-the-internet/

[Stone et al., 2005] Debbie Stone, Caroline Jarrett, Mark Woodroffe, Shailey Minocha, User Interface Design and Evaluation, 2005. *The Morgan Kaufmann Series in Interactive Technologies*. Morgan Kaufmann Publishers Inc., San Francisco, CA.

[Tilastokekus, 2018] Statistics Finland, accessed 26.03.2018. Available as: http://www.stat.fi/

[Trompenaars, 1993] Trompenaars, F., 1993. *Riding the Waves of Culture*. Nicholas Brealey Publishing, London.

[Tulli, 2018] Finland Customs, access date 26.03.2018. Available as: http://tulli.fi

[Tylor, 1871] Tylor, E. B. 1871, *Primitive Culture*.

[Victor, 1992] Victor, D., 1992. *International Business Communications*. Harper Collins.

[Visual Site Mapper, 2018] Visual Site Mapper, http://www.visualsitemapper.com Accessed 05.2018.

[Voehringer-Kuhnt, 2002] Voehringer-Kuhnt, T. 2002. *Kulturelle Einflüsse auf die Gestaltung von Mensch-Maschine Systemen*, Munich: GRIN Verlag.

[W3C, 2018] W3C, https://www.w3.org Accessed 05.2018.

[Wathne et al., 2001] Wathne, K.H., Biong, H., and Heide, J.B., 2001. Choice of supplier in embedded markets: relationship and marketing program effects. *Journal of Marketing*, Vol. 65, No. 2, pp. 54-66.

[Zahed et al. 2001] Zahed, F., van Pelt, W., and Song, J. 2001. A conceptual framework for international Web design. *IEEE Transactions on Professional Communication.* Vol: 44, Issue: 2. Pages 83 – 103.

Appendix 1, Readability Test results

Readability Test Results										
Indicators	Related principles	Type/ Country	News	Food	Tourism	Gaming	Travel	Education	Electronics Brands	Online Shopping
Sentences	P3, I2, U1, L1	China	1390	178	171	363	889	209	463	489
		Finland	239	233	409	276	268	239	20	570
Words	P3, I2, U1, L1	China	2431	339	749	460	1764	625	1038	901
		Finland	1320	439	1170	737	745	753	151	1547
Average Words Per Sentence	P3, I2, U1, L1	China	1,75	1,90	4,38	1,27	1,98	2,99	2,24	1,84
		Finland	5,52	1,88	2,86	2,67	11,47	3,15	7,55	2,71
Average Words Per Page	P3, I2, U1, L1	China	417	73	494	84	215	173	583	123
		Finland	610	247	386	543	301	259	558	565
Images	I2	China	97	5	64	3	57	36	20	20
		Finland	106	16	23	9	4	8	25	77

Table 17. Readability Test results.

Appendix 2, Navigability Test results

Navagability Test Results						
Indicators	Percentage Connected(%)		Hub Pages		Leaf Pages	
Related Principles	P1, P3, M2, U1, L1					
Type/ Country	China	Finland	China	Finland	China	Finland
News	1,64	11,21	1,00	82,00	77,00	26,00
Food	6,31	5,27	45,00	58,00	30,00	76,00
Tourism	623,67	369,39	11,00	4,00	2,00	3,00
Gaming	11,79	28,30	60,00	82,00	27,00	20,00
Travel	71,45	39,13	89,00	9,00	6,00	14,00
Education	50,52	64,28	93,00	84,00	3,00	10,00
Electronics Brands	53,78 (out of 40 pages)	8,01	14,00 (out of 40 pages)	20,00	22,00 (out of 40 pages)	24,00
Online Shopping	130,58	57,03	8,00	97,00	3,00	3,00

Table 18. Navigability Test results.

Appendix 3, Colour Test results

Colour Test Results										
Indicators	Elements detected		Luminosity contranst (Failures)		Brightness difference (Failures)		Colour difference (Failures)		Total number of Colours	
Related principles	I1, I2, I4, M1									
Type/ Country	China	Finland	China	Finland	China	Finland	China	Finland	China	Finland
News	2133	1344	447	835	447	772	554	875	104	43
Food	302	533	38	90	19	20	64	116	46	57
Tourism	1116	687	314	299	276	299	663	523	10	14
Gaming	120	658	41	82	49	70	68	82	55	4
Travel	1103	382	195	160	194	147	412	279	112	22
Education	452	676	83	240	77	179	160	263	27	115
Electronics Brands	72	728	43	123	17	133	66	133	10	15
Online Shopping	362	1209	59	605	56	605	347	605	40	3

Table 19. Colour Test results.

Appendix 4, SitemapTest results

SitemapTest results

Figure 4. News websites' sitemaps. Left: http://news.163.com/ Right: https://yle.fi/

Figure 5. Tourism websites' sitemaps.Left: http://vacations.ctrip.com/ Right: http://www.visitfinland.fi/

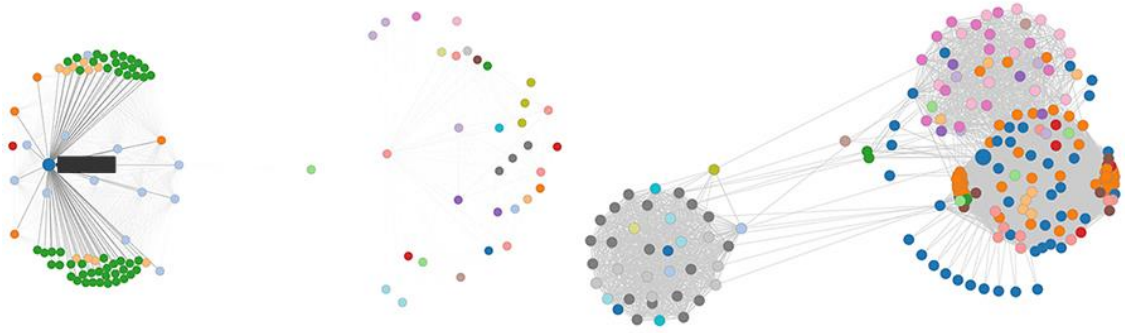

Figure 6. Gaming websites' sitemaps. Left: http://game.qq.com/ Right: http://www.rovio.com/

Figure 7. Travel websites' sitemaps. Left: http://www.airchina.com.cn/ Right: https://www.flysas.com/fi/fi/

Figure 8. Electronics websites' sitemaps. Left: https://www.mi.com/ Right: https://jolla.com/

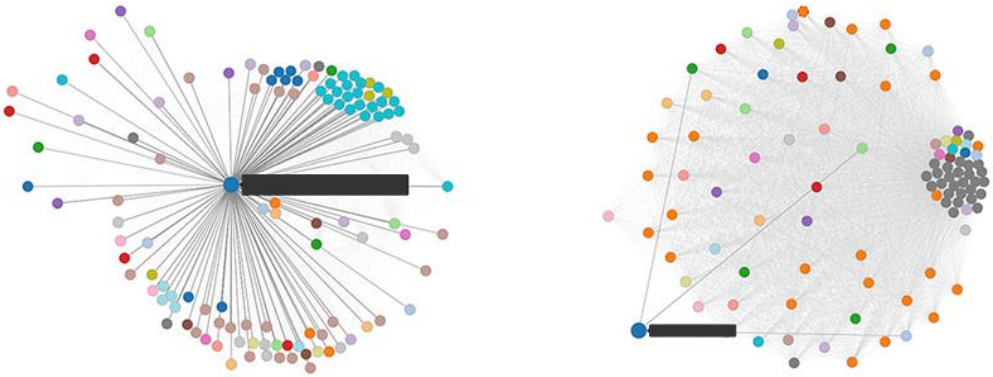

Figure 9. Online shopping websites' sitemaps. Left: https://www.jd.com/index.html Right: https://www.verkkokauppa.com/