# Implementing user-centered development in China

## A cultural approach to software engineering

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# Abstract

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The Chinese IT sector is expanding enormously, and being the second largest in the world, it is expected to grow even bigger than the USA's. However, there are still a number of obstacles concerning the capability to compete internationally.

This Master of Science Thesis is an implementation study for the SESUN project, and has been carried out in Shanghai. The aim of the research project is to bring together the notions of usability, maturity of organizations' development processes, culture, and management, to serve as a study of the current state of usability work in organizations in China. The cultural approach is derived from theories by Professor Hofstede, and the cultural markers of China are considered to be the influence of Confucianism, the concepts of face and guanxi, as well as the hierarchical societal system that is mainly based on authority and living as a part of a group. Since these markers strongly influence the Chinese people, they also influence the way of doing business in China.

Our first hypothesis is that, in general, organizations in China are quite undeveloped concerning usability and user-centeredness. We approached this hypothesis by conducting interviews with Chinese and Western business people, which only confirmed our assumptions. The second hypothesis concerned the growing interest toward user-centered development methods, which we could witness among many of the participants. We also assumed that the multinational companies would be much ahead of the local ones, which seemed to be confirmed in at least some of the cases. As we discussed the cultural differences, we also expected there to be difficulties in applying some of the presented usability methods in China; due to the fact that the methods are developed in the Western countries. These difficulties have been identified and analyzed, resulting in examples of how organizations in China could improve their level of usability work, and to what extent the Western methodology should be re-designed to suit the Chinese culture.

# Sammanfattning

Den kinesiska IT-sektorn expanderar för närvarande kraftigt, och från att idag vara den näst största i världen förväntas den under de kommande åren även passera USA:s. Multinationella företag lägger idag inte bara produktion utan även forskning och utveckling i Kina, och de lokala företagen konkurrerar med de västerländska på den globala marknaden. Trots att Kina förutspås bli den ledande IT-nationen, finns det dock fortfarande ett antal hinder för kapaciteten att konkurrera internationellt.

För att framgångsrikt kunna konkurrera och etablera en position på marknaden krävs, enligt många utvecklare av IT-system, produkter och tjänster av exceptionellt hög kvalitet. Ett sätt att uppnå hög produktkvalitet är att investera tid och resurser i att förbättra produkternas användbarhet för målgruppen. För att kunna utveckla användbara produkter behöver ett antal olika metoder för användbarhetsarbete implementeras i företagets utvecklingsprocess. Bland de viktigaste av dessa är användarcentrerade metoder för att involvera och interagera med slutanvändare av produkten. Detta kan i sin tur kräva stora förändringar inom organisationen.

Detta civilingenjörsexamensarbete har utförts i Shanghai som en studie för det europeisk-kinesiska projektet SESUN. Syftet med arbetet är att integrera frågor om användbarhet, organisationers utvecklingsprocessers mognad, kultur och management, samt att undersöka på vilken nivå användbarhetsarbetet i Kina befinner sig idag. Den teoretiska diskussionen om kultur och kulturella skillnader är huvudsakligen baserad på forskning utförd av professor Hofstede. Utmärkande för den kinesiska kulturen är inflytandet från konfucianismen, begreppen 'ansikte' och 'guanxi', och ett hierarkiskt samhällssystem som till stor del är baserat på respekt för auktoriteter och lojalitet med gruppen man tillhör. Då dessa egenskaper starkt påverkar människor i Kina, påverkar de också hur affärsverksamhet och företagande bedrivs i Kina.

Vår första hypotes var att företag i Kina fortfarande är relativt outvecklade vad gäller användbarhet och användarcentrering. Vi undersökte detta genom att göra intervjuer med kinesiska och västerländska representanter för IT-företag, och resultaten gav också stöd för vår hypotes. Den andra hypotesen rörde det växande intresset för användarcentrerade metoder, vilka vi kunde se hos majoriteten av intervjupersonerna. Vi antog också att de multinationella företagen skulle ha kommit längre än de lokala, vilket våra resultat åtminstone i några fall verkade bekräfta. Till följd av kulturella skillnader mellan Kina och västvärlden, och att de traditionella användarcentrerade metoderna är utvecklade i en västerländsk kultur, väntade vi oss också att det skulle vara förknippat med vissa problem att tillämpa många av de traditionella användarcentrerade metoderna i Kina. Dessa problem har identifierats och analyserats, resulterande i exempel på hur organisationer i Kina kan förbättra sitt användbarhetsarbete, och i vilken grad de traditionella metoderna bör förändras för att passa den kinesiska kulturen.

# Preface

This Master of Science Thesis is the result of a study that has been carried out in Shanghai, China, between February and July 2006. Our thesis also serves as an implementation study for the Sino European Systems Usability Network (SESUN) project. The goal of the SESUN project is to enable Europe and China to collaborate in issues related to the design and development of usable information technology systems that support people in their work and everyday lives. Some of the activities within SESUN include seminars held in China and implementation studies focusing on the topics 'Usability for workers', 'Analysis of localization/cultural requirements', and 'Usability maturity status of Chinese IT organizations'. (SESUN, n.d.)

## Thanks

We would like to express our gratitude to everyone who has helped us to complete this thesis. First of all, many thanks to Professor Jan Gulliksen from Uppsala University for giving us the opportunity to participate in the SESUN project, and for all the help, ideas, support, and fast e-mail replies. Christina Li, the coordinator for SESUN, for taking her time to spend it with us in Shanghai, help with contacts and with language during interviews, and for sharing her wide knowledge about Chinese organizations and people. Our contact person, Dr. Rachel Liu at Tongji University, for help with ideas and contacts with companies. Tongji University, and especially Doris Yang who made our arrival and stay in Shanghai a very pleasant and comfortable experience. Professor Mingsen Guo, for interesting lectures and an interview, which helped us understand the management and cultures in Chinese and non-Chinese organizations. Professor Zhengjie Liu from Dalian Maritime University, and everybody else involved in SESUN, for interesting and fun seminars in Beijing and Shanghai. We would also like to thank some researchers: Professor Stephen Prior and Professor Siu-Tsen Shen for their article that inspired us to find a direction for our research, and Professor Timo Jokela for sharing his knowledge in UMM classification.

Many thanks to all the people who responded and joined our interviews. Without them this work could not have been successful. Also thanks to our friends, acquaintances, and families for all the support; a special thanks to Alice, Tenery, Peter, and everyone else who helped us during our stay and work in Shanghai.

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# 1 Introduction

*In this chapter, we give an overall introduction to the topics of our Masters Thesis. We begin by presenting some information about China and its position in the IT/software market. After that, we introduce the main topics for our research and the aim of our study.*

## 1.1 Made in China

The 21st century is often referred to as the century of China. (Lundberg, 2006) In the last few years, China has become the sixth of world economies, the third largest trade nation and the second in the aspects of purchasing power. Foreign direct investment is flowing into the country and the export has doubled many times over in the past few years. (Schwaag Serger & Widman, 2005) It is predicted that the Chinese economy will surpass that of the USA by 2050, if not even sooner. (Prior et al, 2006) Since China initiated its market-oriented reforms[1] and opened the doors to the world, the country has created large market opportunities and is today considered an important global competitor. It has not only attracted production from other countries, but also gained a better position within knowledge-intensive sectors such as research and development. (Schwaag Serger & Widman, 2005)[2]

In this economic growth, the IT sector has been a driving force. It has already become the biggest sector in Chinese industry and foreign trading. Today, the Chinese IT market is the second largest in the world, just next to that of the USA, and the user population for IT technology is expected to grow even larger. (Liu, 2005) There are still, however, large weaknesses in China's innovation systems[3]. For example, there is a risk that the 'soft' sciences are neglected as a result of the strong focus on science and technology. This is a potential problem since creative environments are usually produced in interaction between 'soft' and 'hard' sciences, where people possess holistic views of systems with all the diverse areas of focus integrated. (Schwaag Serger & Widman, 2005)

China is also a country of large contrasts. Despite the impressive rate of development in the areas of communication, technology and financial sectors, China is still battling with problems such as lacking human rights and poverty in parts of the country. (Schwaag Serger & Widman, 2005) Traditionally, China is known for fast production and a low-cost work force, but also for inadequate working conditions, especially within the industrial sector. One of the reasons behind this is that many Chinese companies are still unaware of such issues as social responsibility. (Sandklef & Kiesow, 2004) Another thing that probably takes time to

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[1]   China's transition from a state planned economy to a more market-oriented started in 1978 with the Open Door Policy. This policy included the initiation of privatization of state-owned companies and allowed for foreign investment in certain parts of the country. Since then, economic liberalization has continued, although on several occasions temporarily halted. The main changes have taken place after 1992, when the reform process has been more actively encouraged. (Linder, 2003)

[2]   It should be noted that the validity of the numbers in statistics given by the Chinese government has been questioned. Even the Chinese acknowledge that statistics compiled from the country's many provinces might not be reliable. However, it is generally accepted that the growth in China has been substantial. (Sandklef & Kiesow, 2004) (Chee & West, 2004, p.19)

[3]   An innovation system can be defined as "the flow of technology and information among people, enterprises and institutions which is key to an innovative process. It contains the interaction between the actors who are needed in order to turn an idea into a process, product or service on the market." (Wikipedia, 2006e)

change is the view on individual rights. Protection of individual rights was not discussed in traditional Chinese law, nor was it acknowledged by the legal system in China before the reforms (Linder, 2003). Although today's Chinese law regulating working conditions is relatively extensive, there is lack of capacity to make sure that it is followed. Also, Chinese organizations still have limited experiences of including various stakeholders[4] in the decision making. (Schwaag Serger & Widman, 2005)

## 1.2 Research topics

In the following chapter we briefly introduce the central topics of our research. The main theme is how and whether the user-centered principles and experiences of usability work in Western countries[5] can be used to improve system development work in China. In trying to apply these ideas we mean that it is important to take into account cultural issues as well as the way management and organizations[6] function in the country.

### 1.2.1 Usability and user-centered design

The Chinese market has become highly competitive since many large international companies want their shares of it. (Chee & West, 2004, p.30) This has resulted in increasing competitive pressure on Chinese product and service suppliers in order to stay on the markets. The IT sector is no exception. (Smith et al, 2005) (Liu et al, 2002)

One way to gain a competitive advantage, according to Smith (2005), is to understand the discipline of human-computer interaction and to implement usability principles into product development. Smith also claims that understanding these principles is critical if China is to develop successfully in the international IT market. (Smith, 2005) Out of the products' users' point of view, a product's quality is determined by its level of usability, and therefore this attribute is critical in deciding the product's competitiveness. (Liu et al, 2002) Usability means that a product is usable, that it is adapted to the specific users, and that it should cater the users' specific needs and affords support for the tasks the user wants to perform. (Boivie, 2005) A way to achieve usability is by implementing work processes that support user-centered approaches and development activities. (Liu et al, 2002) [7]

It is not uncommon that a customer organization wants customized products and services to cater its specific needs, and this usually requires close working relationships between the provider and the receiver. (Gray & Larson, 2003, p.11) In order to win customers' loyalty in the competitive markets, organizations in China are therefore starting to pay more attention to customers' specific needs when delivering IT systems and software. (Smith et al, 2005)

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[4] A stakeholder is any individual who is affected by or interacts with the system.
[5] We have defined 'Western countries' to include the USA, Canada, Australia, New Zealand, and Western Europe, but in our report, the focus will be on the USA and the Scandinavian countries. The common definition of Scandinavia includes Sweden, Norway, and Denmark, and sometimes also Finland and Iceland (Wikipedia, 2006h).
[6] In this report, we use the terms 'company', 'organization', 'enterprise', and 'business organization' as synonyms.
[7] Usability and user-centered approaches are discussed more in detail in chapters 3.2 and 3.3.

### 1.2.2 Culture affects usability

In this thesis, we argue that culture is one of the factors that affect the user experience and usability of a system, but also that it is relevant to the methods for system development. Today, users of IT systems are not only from the Western cultures, but from all kinds of cultural backgrounds. It is therefore important to realize that products and methods that are considered usable in one cultural context might not be usable in a different culture.

There are many ways in which culture can be of importance. First, culture can affect usability because the designer's cultural values are reflected in the design of a system. This can lead to problems if the designers' values are in conflict with the users', which could be the case if the designer and the users are from different cultures. In such cases, the users might not accept the system. (Calhoun et al, 2002) It is also important to take into account the cultural differences between users because people from different cultures have different expectations and therefore will perceive the usability of the system differently. (Hillier, 2003)

Second, different work methods are used in different organizations. These methods are also culturally rooted and result in how users' needs are taken into consideration. Cultural differences are therefore of relevance not only to system design but also to the design process. Behind the user-centered ideas is the Western view that users as individuals have a democratic right to influence the development and design of systems that they are expected to use. However, the underlying assumptions can have some difficulties if they are transferred to other cultures. (Smith et al, 2004)

As a consequence, applying the same usability principles and user-centered methods in China as in the Western countries could be associated with certain problems. A starting point for improvements of development work in China should therefore be to understand the Chinese culture.

### 1.2.3 Usability work depends on management

Work processes in organizations are defined by the top management. The top management also to a large extent defines the culture within the organization, such as the standards of behavior, structure of authority, and how to reach business goals. Because of this influence, there is a strong connection between the management system of an organization and the success of its software projects. (Gray & Larson, 2003, p.73) This influence also means that the possibilities for implementing usability principles are dependent on management support, but also on the attitudes within the organization.

Management is influenced by the surrounding national culture and managers must be understood as a part of their societies. (Hofstede & Hofstede, 2005, p.20) For this reason, we argue that a discussion about management and organizations should take into account the culture in which the organization operates. Culture affects usability work not only directly, as discussed above, but also indirectly by influencing how organizations function and, as a consequence, the prospects for introducing and applying user-centered methods.

## 1.3 Aim of the research

This thesis studies and discusses how user-centered principles can be used in system development in mainland China. There are three main aims of our research. The first of these is to investigate whether business organizations in China work user-centered when developing IT systems, and if so, how this is done. Our second aim is to examine and analyze the conditions for introducing and improving user-centered work in China. More specifically, we aim to identify the obstacles to usability work, related to Chinese culture and management. Finally, we discuss how the organizations' development processes can be improved to become more user-centered, given their current usability level and the conditions identified.

Our study attempts to fill in gaps and to complement earlier research on usability maturity of companies in China. This previous research has been limited in scope and therefore more studies are still needed. The earlier research indicated that Chinese companies are still on a beginner's level when it comes to applying a user-centered approach to software development processes. (see Liu et al, 2002) As mentioned above, one of the purposes of this study is to find out if this conclusion is still valid. By adding a cultural approach to user-centered design we also aim to find out if there are cultural factors that make it more difficult to reach higher maturity levels of usability work.

Another way in which this study attempts to complement earlier studies is that we treat culture, business management and user-centered design as intertwined.

### 1.3.1 Our hypotheses

We have four hypotheses or starting points. The first concerns the expected level of usability maturity in the Chinese IT industry. We expect to find that the companies in general do not work user-centered, meaning that they are still on a low level of usability maturity. This is partly based on results from the earlier study made by Liu et al (2002)[8], which indicated that IT companies at that time were on the lower level of the scale which was used to assess usability maturity. Even though the Chinese IT industry is developing fast, we do not expect companies to have moved up to the top levels of usability maturity in only a few years. Another reason for this hypothesis is that the software industry is a relatively new sector in China[9] and user-centered principles were introduced only recently.

The second hypothesis concerns the growing interest among Chinese companies to implement or improve their user-centered work methods. We assume that the interest exists, since the benefits are well documented in the Western countries, although we expect that some obstacles to these improvements still remain.

The third hypothesis concerns differences between multinational and Chinese companies. We expect to find that in general, foreign companies are more aware of user-centered ideas and to a higher degree apply these principles. This is because the concepts are relatively well-known

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[8] The study will be described in chapter 3.3.5.
[9] Software industry began to develop in China in the 1990s. Since then, it has been growing fast, especially in the last few years. As an example, around 2000 of the 8700 registered software development organizations which existed in 2003 had been founded that same year. (Greeven, 2006)

in the Western countries' IT industries, and many of the large multinational companies already apply usability principles in their countries of origin.

Finally, the fourth hypothesis is related to the earlier discussion about culture. As mentioned earlier, we believe that there might be difficulties associated with applying 'traditional' user-centered principles in China due to cultural differences between China and the Western countries where the principles were developed. Because of this, we expect to find that companies trying to apply user-centered ideas in China meet certain problems, and as a result of this perhaps do find the methods suitable or have had to adjust them to better fit the Chinese culture.

## 1.3.2 Our delimitations

In our work, we have had to choose to focus on certain aspects while other topics are left out of the discussion. For example, we are aware that China's socialist past in many different ways has affected the Chinese economy and how Chinese organizations function.[10] It could therefore be of relevance for the discussion about organizations and management; however, we have chosen to exclude this in order to prioritize discussions about culture. Although the influence of communism should not be underrated, we believe that there are other aspects of the Chinese society that have existed for a much longer period and that could be more important to usability work.

There is also a geographic delimitation: we have only included companies operating in Shanghai. The reason is mainly practical. China is a vast country and for this reason we have found it necessary to focus on one geographical area. Since Shanghai belongs to the country's most well-known high-tech areas and some of the best performing IT companies are located here (Greeven, 2006), it can be assumed that IT companies in Shanghai are among those that are most likely to be familiar with user-centered ideas and to belong to the most 'mature' companies in terms of usability.

Some of our topics are also discussed more in detail than others. The first case concerns culture and management. Although we discuss both these topics and argue that both are important, we have chosen to emphasize the cultural issues. The other case concerns the discussions about culture related to usability, where we discuss two aspects: interface or system design, and development methods and processes. We are mainly interested in the second one of these, and the focus is therefore on how the usability methods and development processes are influenced by culture and management.

Although we mainly discuss development of IT systems that are to be used for work, we believe that most of the discussions should be relevant also for the development of other types of systems.

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[10] For example, Child and Warner (2003) claim that political issues have been an important factor in shaping modern Chinese management.

## 1.4 Disposition

Following is chapter two, which describes our research methods and sources, and some difficulties along the way to the success of the work.

As our research focuses on three main categories, namely user-centered design, culture, and software development in mainland China, we start by discussing what we mean by these concepts. Chapter three focuses on human-computer interaction, defining the concepts of usability, user-centered design and some other important features. We summarize some earlier studies of the state of user-centered development work in China and argue for the benefits of having a user-centered approach. Chapter four continues by defining the concept of culture and discussing how it can influence the user-centered design work. Some features of Chinese culture are presented and compared with features in Western cultures, i.e. Scandinavian countries and the USA. We also present the theories of Professor Hofstede and discuss them in the context of user-centered design. Chapter five presents software development methodologies, organizational culture, some features of Chinese organizations, and concepts of maturity in organizations, both concerning development processes and user-centeredness. It also mentions some obstacles to usability work and ways to improve usability maturity.

In chapter six we have collected the empirical data which was gathered during our time in Shanghai. The chapter is organized to present the companies and the persons that contributed to the research, and is based on the interview guides we created prior to the interviews. Finally, chapter seven includes our own reflections and analysis of the research topics. Interview guides and tables are included in the appendices.

# 2 Research methods

*In this chapter we present how we have carried out our research. We also discuss some problems in using the chosen methods and resources for the research work.*

This report is mainly based on literature studies and interviews with people working in the IT industry in China. In the initial phase of the research work, we aimed to get an overview of the areas of interest. Academic research papers and contacts with researchers in Europe and China provided background information as a basis for the further work. A more extensive literature study was then performed. Using databases such as ScienceDirect, we have searched for articles on user-centered design, cultural studies within human-computer interaction, management, Chinese culture and cross-cultural issues. We also use information, primarily about management and organizations in China, from literature by Chee and West (2004), Wah (2003), and Gray and Larson (2003)[11].

Information about software development in China is also taken from a software project management course given by Tongji University, Shanghai, during the spring semester of 2006. Other sources include informal discussions with Westerners living and working in China, as well as own observations of Chinese culture during the months we have spent in Shanghai. Such information has been documented by notes in diaries.

## 2.1 Interviews

In total nine interviews have been conducted. The first of these was an interview with a professor from Tongji University, whereas the other eight interviewees were representatives from companies operating in Shanghai. All of the interviews took place in Shanghai between April and June 2006. They usually lasted between 45 and 90 minutes and took place in the participants' offices or at cafés. In most cases the interviewees suggested the time and place for the interview.

We both participated in all interviews except one, and during most of the interviews we took turns to ask questions and take notes. Results and impressions were discussed and summarized shortly after the interviews. The interview questions were based on the theoretical knowledge basis sampled by us during the research period and which is presented in chapters three, four, and five. The interview guides are included in the Appendix.

All except one of the interviewees are of Chinese origins. The last person is Swedish. All of the interviews except one have been carried out in English; the exception being the interview with the Swedish interviewee, where Swedish was used instead. We have therefore mainly carried out the interviews ourselves, without interpreters. However, the SESUN coordinator

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[11]  Harold Chee, specialized in the areas of Chinese business, leadership and marketing, lectures at Ashridge Management School, UK. Chris West, a graduate from the London School of Economics, is the Managing Director of a marketing research and consultancy company called Competitive Intelligence Services. Dr Sheh Seow Wah is a lecturer at the Singapore Polytechnic's School of Business. Erik Larson is professor of project management in the department of management, marketing, and international business at the College of Business, Oregon State University. Clifford F. Gray is professor emeritus of management at the College of Business, Oregon State University.

Christina Li participated in four of the interviews done in April, as part of her research. In these cases, she also provided help with translations between Chinese and English when needed.

### 2.1.1 The first interview: Professor Mingsen Guo

The aim of the first interview was to get initial information about software development in China, including commonly used methods, organizational culture, and attitudes toward human-computer interaction. We were especially interested in how these aspects differ from those in Western countries. The choice of interviewee was based on the fact that Professor Mingsen Guo has experiences from working in the IT industry in both China and the USA, and therefore would be able to make comparisons between the Western and Chinese habits and attitudes.

In contrast to later interviews, this interview can be characterized as unstructured. Unstructured interviews can be used in the beginning of the research to gain initial information, for example as a basis for later interviews. The interview is exploratory, and there are no preset questions beyond the general topic. (Merriam, 1994, p.88) However, in this case some questions were prepared in advance, as a starting point for the discussion.

### 2.1.2 Interviews with companies and usability experts

The remaining eight interviews were performed with representatives from seven companies. One interview was conducted with a representative from a Chinese company specialized in usability work. The aim of this interview was to get information about ways to work with usability issues and how user-centered ideas are applied in China. Of special interest were questions about the methods used by the company and if they in any way had to adapt 'Western' methods to Chinese culture, if they experienced any problems associated with working user-centered, and how they felt about the 'traditional' user-centered methods and principles. We wanted to include 'usability experts' among the interviewees because it can be assumed that such companies are among those with the best knowledge about the 'traditional' user-centered methods. It is likely that they have tried many different techniques and therefore are able to tell for example which methods, in their experience, work best in the Chinese culture.

The aim of the remaining interviews was to get to know how software development currently is done in China, and especially if user-centered principles and methods are used. Our questions concerned products and customers, company culture, development processes, and usability work. Usability work questions included for example questions about contacts with customers/users, how requirements are defined and how the products are tested. In the interviews, we were not only interested in facts about the company's development work, but also the interviewee's opinions and attitudes toward user-centered ideas.

All of the interviews were semi-structured. In semi-structured interviews a set of questions is prepared beforehand, but the interviewer is free to add other questions in order to explore interesting topics that were not foreseen (Merriam, 1994, p.88). We prepared a list of basic questions which was sent to the interviewees prior to the interviews. The interviews were then

structured based on these questions. However, depending on the interviewee's position in the company and answers on earlier questions, some questions were considered irrelevant while other topics were discussed more in depth. Especially the set of questions concerning user-centered design work had to be adjusted depending on whom we talked to.

Before the interviews took place, the companies' web sites were usually explored in order to get background information about the companies' activities. The exception was one of the Chinese companies, since the web site was only available in Chinese.

### 2.1.2.1 Participants

As mentioned earlier, one of the participants worked at a company specialized in usability work. This person worked as a project manager and usability expert at the company.

Representatives from six other companies were interviewed. Two of the companies were Chinese, three from the USA, and one was Scandinavian. Three of them, including one of the Chinese, develop B2B techniques[12], whereas the others have the general public as their customers. One develops mobile applications, another develops web applications, and the third develops an information service where information is delivered via mobile phones.

The interviewees from the six companies all belong to one of three categories of professions: management (a product manager, a CEO[13]), technical work (a system developer, two software engineers), and usability work (a human factors engineer, a technical writer). The different professions lead to a difference in focus between the interviews. For example, when interviewing people working with usability there would be more detailed information about usability work, whereas interviews with managers tended to give more information about company culture and organizational issues.

The selection of participants has mainly depended on personal contacts and if the persons we contacted were willing to share their time. Initial contacts with six of the interviewees were established via personal contacts, while two were contacted directly by us at a SESUN seminar in Shanghai in May. We have, however, tried to find companies that differ in various ways, to get a broad sample of organizations operating in China. The first criteria concerned country of origin, since we wanted to include both Chinese and non-Chinese companies to see if multinational companies' methods differ from Chinese companies'. That the majority of the companies included are non-Chinese reflects the fact that the software sector in China is still dominated by foreign companies (Greeven, 2006). When contacting non-Chinese companies, priority has been given to American and Scandinavian companies, since in this report examples of Western culture are based mainly on the USA and Scandinavia. We also tried to include companies that develop different kinds of systems or products, and to include both small and larger companies.

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[12] B2B stands for Business-to-Business, which means relations between companies, contrary to relations between a company and other groups such as consumers or public administration. (Wikipedia, 2006b)

[13] CEO stands for Chief Executive Officer, which is the highest ranking corporate officer or executive officer of a company. (Wikipedia, 2006c)

In all cases, the names of interviewees have been changed.

## 2.1.3 Analysis of interview results

Our first aim of this thesis concerned the current state of usability work in organizations in China. To be able to answer this question, we need to have a definition or model that can be used to determine if an organization works user-centered or not. Preferably we should also have some way to distinguish between levels of user-centeredness. We have therefore chosen to analyze the results from the interviews with the six companies according to a Usability Maturity Model called UMM-HCS[14]. There are different models for analyzing usability maturity, and this model has been chosen mainly because the UMM-HCS approach is considered especially suitable for organizations which are new to usability (Liu et al, 2002) and is intended to assist those who wish to improve their organization's maturity with regards to usability matters (Earthy, 1998). The UMM-HCS defines levels of user-centeredness and describes what is required of an organization at a given level. It can therefore be used to determine the organizations' current level of user-centeredness and to categorize the organizations on the basis of their state of usability work. We have also used the UMM-HCS categorization as a basis for the discussion about improving the companies' work methods.

We also wanted to examine the conditions for working user-centered in China and to find out if there are any special obstacles to usability work. One way to find an answer to this is to interview people who can describe their experiences of applying usability techniques, such as the 'usability expert' company. In this report, the question is also discussed and analyzed based on information about Chinese culture and how this affects the Chinese work environments and habits. Information about Chinese culture has been gathered from literature as well as observations and interviews, and it has been used both for the discussion about conditions for usability work and for the discussion about improvements of work methods and how to best introduce usability work.

Much of the discussion about culture and how culture affects usability work is based on Professor Geert Hofstede's theories about cultural differences. It is a popular and well known model which has been very influential within culture research and which is often used in information systems literature. (Calhoun et al, 2002) (Hillier, 2003) However, Hofstede's work has also been criticized. According to Simon (2001), one of the claimed weaknesses is that Hofstede gathered information from a single organization and that the culture of this organization could have a homogenizing effect which might subdue cultural differences. MacGregor et al (2005) also discuss Hofstede's theories and the arguments against his work. One of these arguments is that his work "assumes cultural homogeneity, does not analyze work patterns and does not pay enough attention to the dynamic nature of culture". Still, both Simon and MacGregor et al find Hofstede's model worth using. Simon claims that there is other empirical evidence supporting the model, and according to MacGregor et al, the model "provides a good framework for beginning to understand cross-cultural issues".

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[14]   HCS stands for 'Human Centeredness Scale'. This model was developed for the European INUSE project in 1991. The version that we have used is version 5.1.4, from 1998. The UMM-HCS is described in chapter 5.5.

## 2.2 Difficulties along the way

Perhaps the main problem during the project work has been finding interviewees. Some of the people we have contacted did not have the time to participate, while others were simply not interested in being interviewed. In a few cases they did not want to take part in the study after having seen our questions, and in one case the potential interviewee's manager did not allow her to participate.

Our initial project plan also included interviews with end users. However, this was not possible to arrange. One reason was that the companies we interviewed were not eager to let us contact their customers. Another was that when we tried to get in contact with some of the customers, they were not particularly interested in participating in interviews. In most cases we received no reply at all, and one of the customer organizations told us that they would only consider participating if a representative from the development organization, their supplier, would be present at the interview.

People in different positions in a company have knowledge about different activities, and in some cases the persons we interviewed did not have the right position in the company to be able to answer all our questions. For example, in one case where the organization developed software for the Japanese market, the employees in China were not involved in any of the activities which we wanted information about[15] and therefore the interviewee could not tell us any details about how these activities were done.

Because our questions concerned both how actual development work was carried out and more 'strategic' questions about organizational structure and culture, the ideal would have been to perform at least two interviews with each company. Preferably the interviewees should have been one of the organization's developers and someone with a management position. Another problem with doing only one interview is that we only get information about one person's opinions, and these do not necessarily reflect the opinions of the majority of the organization's employees. For these reasons we tried to arrange more interviews with people from the same companies, but without any success. As a result, we have not in all cases been able to get answers to all the questions and the material is therefore not always as complete as we would have liked.

## 2.3 Method discussion

First of all, it should be remembered that the Chinese society is changing rapidly. As a result there is a risk that much of the available information, especially about organizations in China, quickly gets outdated. In selecting literature, we have therefore given priority to material that is written in the last few years. It is likely that the changes affect how Chinese organizations function, and this can make it more difficult to draw conclusions about the conditions for usability work, simply because the conditions are also changing. However, much of the

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[15] A similar problem is noted by Liu et al (2002) in their study of usability work in China. They found that in development where software is exported to the Japanese market, it is common that the Chinese company is only responsible for detailed design, coding and testing, while requirements analysis, design and any direct user contact is handled by others who are located in Japan.

discussion in this report concerns culture and how it affects usability work, and there is reason to believe that many cultural issues change more slowly. For example, according to Hofstede and Hofstede (2005) cultural practices in a society can sometimes change relatively fast, but the basic values of the same society are characterized by stability and should rather be seen as given facts (Hofstede & Hofstede, 2005, p.12f). Still, it is important to acknowledge that Western influence affects for instance managerial issues in China. There are also studies indicating that younger managers in the big cities are beginning to adopt some 'Western' values such as a higher degree of individualism, while at the same time maintaining other, traditionally Chinese values. (Child & Warner, 2003)

Another potential problem is that due to the language barrier much of the information is non-Chinese. There is, of course, a risk that these descriptions of Chinese culture or Chinese organizations can be misleading. A person's perception of things around him/her is always 'colored' by his/her cultural background (Hillier, 2003) (Hylland Eriksen, 2000, p.28). Western authors describing or discussing Chinese culture are influenced by their own background and values, and a lack of understanding of the Chinese culture could lead to erroneous conclusions. On the other hand, using only Chinese sources could lead to another problem: it is likely that people can have difficulties interpreting and describing their own culture, since many things in one's own culture are probably taken for granted. We have therefore tried to find both Chinese and non-Chinese material.

We acknowledge that the possibilities of drawing general conclusions from our study are limited since we have interviewed relatively few persons, all of them working for companies operating in Shanghai. More studies are therefore needed in order to get a complete picture of usability work in China. However, it is still possible to find some common themes and trends in the material, and to compare with earlier studies of the IT industry in China to find similarities or differences.

### 2.3.1 Problems related to interview studies

There are several reasons why we have chosen to use interview studies as the basis of this report. For example, one of the things we wanted to investigate was attitudes to and knowledge about usability, and the easiest way to get information about such things as subjective opinions, feelings and thoughts is to interview people (Preece et al, 1994, p.628). Another advantage is that in interviews it is easy to follow up on interesting topics and ask for clarifications when needed (Merriam, 1994, p.100). However, when studying how work is done, it is often difficult to get complete information from an interview. Some things can be difficult to express in words, but there is also a risk that the interviewee describes the 'official' procedure, the way things are supposed to be done, rather than how things are actually done in practice. Therefore the interviews should preferably be combined with observations. (Benyon et al, 2005, p.222)

In our case, the ideal would have been to complement the interviews with observations of how actual development work is carried out in the companies. We chose to only conduct interviews, since it would probably have been difficult to get access to the companies' development teams. It would also have taken a lot of time, since in order to gather meaningful information we would have needed to observe the work during a longer period and preferably

either follow a project through all the development phases or observe several projects which were in different development stages.

When doing interviews, a problem is that the interviewer could influence the interviewee to give certain answers. One way to handle this is to involve more than one interviewer. (Tasker, 2000, p.123) We hope that this risk has been reduced, or that any kind of bias would have been discovered, since both of us have participated in interviews, asked questions, taken notes and analyzed results.

Other potential problems are due to the fact that our cultural background differs from that of most of the interviewees. In interviewing and observing Chinese people and later interpreting the results, we are obviously influenced by our Scandinavian background. On the other hand, being new to the culture and customs gives us an opportunity to explore the Chinese culture 'from the outside'. As mentioned earlier, a person might have problems interpreting and analyzing his/her own culture, and therefore might miss things that a person from another culture might see. However, it is difficult to say exactly in which ways our background can have influenced how we perceived and interpreted observations and comments regarding Chinese culture or the conclusions we have drawn; yet it should be taken into account when reading this report.

Our background is also relevant in another way: because English is not our or the interviewees' first language, there is also a risk that answers or questions can have been misunderstood. In the four first interviews, and especially the first of these, help was provided with translating some of the answers. The interpreter was of Chinese origin, but has lived in England for several years and therefore probably is, to some extent, used to the 'Western' way of thinking. Using an interpreter means that information is 'filtered' because of the translation process, and in these cases it is likely that the interpreter's cultural background could also have an influence on the results.

Another question concerns the selection of respondents. As mentioned earlier, we got in contact with some of the interviewees at a SESUN seminar. Participants in the SESUN seminar are probably already to some extent aware of or interested in usability issues, and it is therefore possible that we have chosen to interview persons that are more positive toward usability work than the 'average' people involved in development work in China. However, this only concern two of the interviewees and of these, only one was a representative from the six companies[16], while the other was the representative from the 'usability experts'.

## 2.3.2 China is not 'one culture'

When we discuss China and Chinese culture, this should be understood to mean mainland China. This is not including for example Hong Kong or Taiwan. However, since China is a vast country, roughly the same size as the whole of Europe, there are clearly differences even within mainland China. For example, there are many ethnic groups and subcultures. The largest ethnic group, the Han, constitutes around 92 percent of the population, but there are also 55 other ethnic groups. (Sandklef & Kiesow, 2004) Many different languages are also

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[16] 'Company 5'

spoken. Although a majority of the Chinese speaks Mandarin as their first language, there are in total 80 languages and over 200 dialects. There are also substantial cultural differences between regions: between the south and the north, between coast and inland, and between the modernizing cities and the poorer, more traditional countryside. (Chee & West, 2004, p.3ff)

Although we are aware of these differences, we have chosen to discuss China as 'one culture'. This is a simplification that we find necessary since it would be too complicated to discuss all of its different subcultures separately. It can also be argued that, despite the differences, some factors exist that make it possible to speak of a 'Chinese culture'. For example, Confucian values for thousands of years have had an influence on the Chinese people. In the 20th century, communism has also contributed to a certain degree of homogeneity. (Chee & West, 2004, p.3f)

For the same reason that we have chosen to treat China as one culture, we also use the term 'Western culture' although naturally there are also differences between countries and subgroups within the Western countries.

# 3 Human-computer interaction (HCI)

*This chapter aims to highlight some of the many aspects of human-computer interaction, usability, and user-centered development. We define what we mean by users, and which key principles are related to the user-centered processes. We also present some of the benefits user-centered product development brings to system users, customers, and organizations.*

## 3.1 What is HCI?

There are a number of definitions of HCI. For example, Hartson (1998) defines HCI as "a field of research and development, methodology, theory, and practice, with the objective of designing, constructing, and evaluating computer-based interactive systems, including hardware, software, input/output devices, displays, training and documentation, so that people can use them efficiently, effectively, safely, and with satisfaction." (Hartson, 1998) However, perhaps the most commonly used is the following definition by ACM SIGCHI Curriculum Development Group: "Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them." (ACM SIGCHI, 2004)

The discipline of HCI focuses on how humans and computers interact, how this interaction can be improved, and how to support the development of more useful systems. ACM SIGCHI describes the discipline as follows:

> "Human-computer interaction is concerned with the joint performance of tasks by humans and machines; the structure of communication between human and machine; human capabilities to use machines (including the learnability of interfaces); algorithms and programming of the interface itself; engineering concerns that arise in designing and building interfaces; the process of specification, design, and implementation of interfaces; and design trade-offs. Human-computer interaction thus has science, engineering, and design aspects."

(ACM SIGCHI, 2004)

This definition implies that knowledge about many different areas is required, and HCI is indeed a multidisciplinary field. It uses theories and research from such areas as engineering, cognitive psychology, social sciences, design, linguistics, communication theory, operating systems, computer graphics and programming. (ACM SIGCHI, 2004)

There are, according to ACM SIGCHI, four major areas, or interrelated aspects, of HCI. These areas, shown in figure 1, are: the use and context of computers (U), human characteristics (H), computer system and interface architecture (C), and the development process (D). (ACM SIGCHI, 2004) (Göransson, 2001)
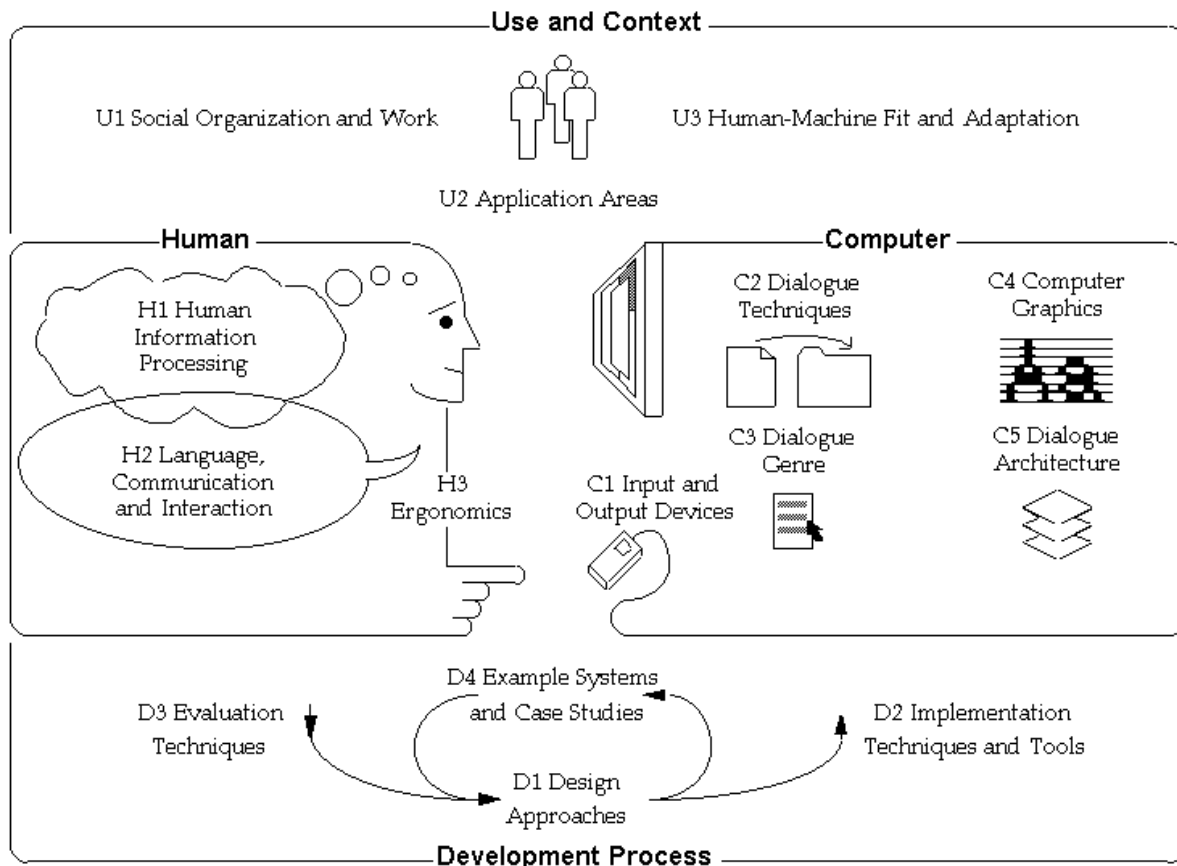
*Figure 1 - The four interrelated aspects of HCI. Source: ACM SIGCHI (2004).*

All of these areas have to be considered in system development. In order to successfully develop an interactive system, one has to understand the context in which the system will be used. This includes the users' background, skills and limitations, their tasks, and the surrounding environment. It is important, but not enough, to understand human capabilities and limitations in general. There also has to be knowledge about the specific users and usage of the system. Additionally, there has to be a process to guide the system development, and one has to understand the technical possibilities and limitations. (Göransson, 2001)

Traditionally, HCI work concentrated on one of these four factors: general human psychological processes and how they affect the interaction with computers. The research dealt mainly with the interaction between a single person and a desktop computer through a graphical interface. (Benyon et al, 2005, p.99f) Although this is still considered important, HCI today is seen as a much broader field. HCI knowledge can be used in the development of all kinds of computer systems, including for example air traffic control, office systems and computer games (Preece et al, 1994, p.1). More recently, there has also been increasing interest in how HCI can be used to design the interaction with embedded systems such as microwave ovens, cars, digital cameras or washing machines (Benyon et al, 2005, p.656f).

## 3.2 Usability

Usability is a central concept in HCI, because the ultimate goal of HCI is to develop usable systems. The idea is that HCI can contribute to system design by developing theories and methods that can be used to achieve higher usability for users of computer systems. (Hartson, 1998) (Borälv, 2005)

There are several definitions of usability, but one thing that most of the definitions have in common, according to Hornbæk (2006), is that they acknowledge that usability depends on the context. That usability is context dependent means that the usability of a system cannot be measured in isolation and that a system has no intrinsic usability. If a system is usable or not depends on how it will be used and who the users are. (Gulliksen & Göransson, 2002, p.62ff)

Of the different definitions suggested, we have chosen to use the definition of usability stated in ISO 9241-11: "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use." The concepts of effectiveness, efficiency, satisfaction and context of use are defined as:

- Effectiveness: "Accuracy and completeness with which users achieve specified goals."
- Efficiency: "Resources expended in relation to the accuracy and completeness with which users achieve goals."
- Satisfaction: "Freedom from discomfort, and positive attitudes towards the use of the product."
- Context of use: "Users, tasks, equipment (hardware, software and materials), and the physical and social environment in which a product is used."

(Göransson, 2001)

Usability does not only concern user interface design, but includes all aspects of the interaction between users and the system. (Bosch & Juristo, 2003) (Benyon et al, 2005, p.14) It has also been pointed out that focusing on usability is not only about attention to the product itself; it also requires an effective process which includes usability efforts in all phases. (Hartson, 1998) It is important to realize that usability is not something that can be added in the end of the development process, for example by doing usability evaluations just before product release, because at that stage it is normally too late to correct other than minor usability problems. Instead, usability efforts should be included already from the beginning of the process. (Olsson, 2004) (Bosch & Juristo, 2003)

## 3.3 User-centered design (UCD)

HCI is based on the belief that the system development should be informed and influenced by the users' needs, capabilities and preferences. (Preece et al, 1994, p.15) However, users are not homogeneous. Certain psychological and physical characteristics are shared by all humans, but many personal characteristics and requirements differ between individuals. (Preece et al, 1994, p.35) The idea behind user-centered design (UCD) is to focus on understanding the specific users, their environment, and tasks. This information can then be

used to adapt the system to users' needs, with the goal of developing usable and useful systems. (Olsson, 2004) Rather than being a theory or a method, UCD should be seen as an approach to system development. (Boivie, 2005)

### 3.3.1 Who is the user?

By 'users' we mean end users. A user, according to this definition, is a person who will use the system for work or other tasks, and who interacts with the system. Normally, the person who is responsible for purchasing the system does not belong to the end user group. It is important to be aware of this; if the aim is to understand the real users' needs, it is not enough to talk to the person who orders the system. Even if he/she believes that he/she knows how the system will be used and what the users need, this is rarely the case in practice. (Gulliksen & Göransson, 2002, p.102)

### 3.3.2 What does 'user-centered' mean?

The term UCSD, which stands for User Centered Systems Design, was first used by Norman and Draper in 1986. The same year, Norman described user-centered design in the following way: "User-centered design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming. The needs of the users should dominate the design of the interface, and the needs of the interface should dominate the design of the rest of the system." (Göransson, 2001)

There are different definitions of user-centered design and different views on the importance of involving users actively in the development process. The word 'user-centered' does not necessarily mean that users take active part in the process, but only that all the activities should focus on them and their needs. However, most approaches today seem to advocate a more active role for users. For example, Gulliksen and Göransson (2002) claim that real or potential users should be involved actively throughout the whole process and take active part in design. (Gulliksen & Göransson, 2002, p.102)

User-centered approaches often argue that the best way to gather information for system development is by visiting the customer's organization and observing the users. Only in this way is it possible to find out what the users need and to understand the context of use. To get this understanding, everyone who is part of the development team should visit the customer's organization and meet real users. (Gulliksen & Göransson, 2002, p.250) This includes the developers, since they are often the ones to make detailed decisions about system structure. To be able to make appropriate choices, they need to understand who the users are and how the system will be used. (Beyer & Holtzblatt, 1998, p.11f)

It is also important to understand that UCD differs from traditional market analysis, and that those two have different goals. Marketing is about understanding how the market functions and what people will buy. It can be used as a starting point, to find out what kind of product people need, but more detailed information is needed for design decisions. Getting this information is the goal of the user studies. (Beyer & Holtzblatt, 1998, p.30f)

### 3.3.3 A user-centered process

Gulliksen et al (2003) define UCD as "a process focusing on usability throughout the entire development process and further throughout the system life cycle". The basic elements of this user-centered process are shown in figure 3. (Gulliksen et al, 2003)
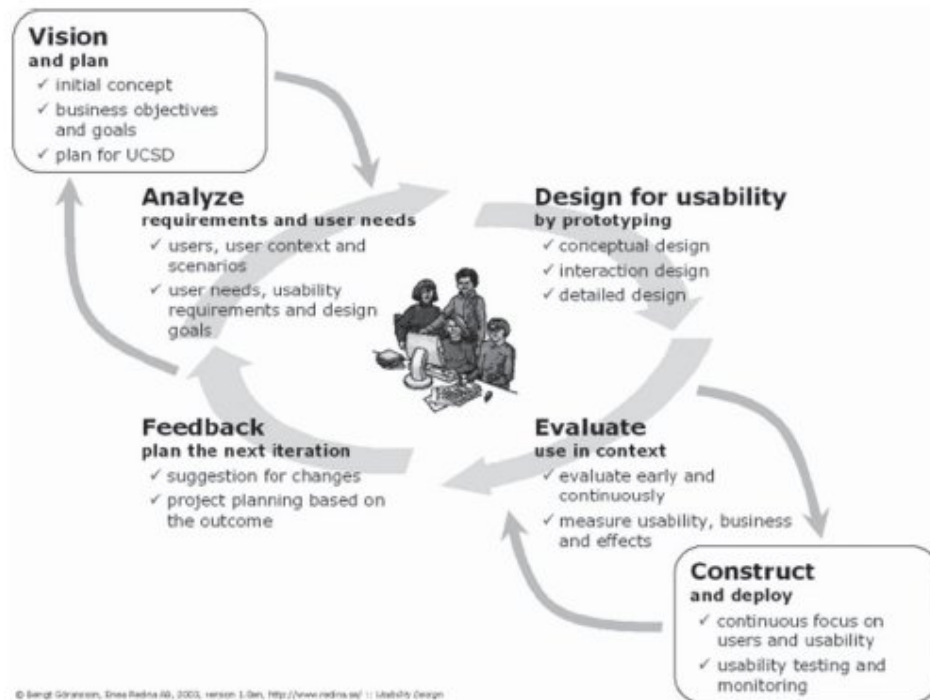


*Figure 3 - The basic elements of the user-centered process. Source: Gulliksen et al (2003).*

Figure 3 also illustrates one of the central ideas in user-centered development: iterative development. The basic idea behind this kind of development is that it is not possible for usability experts and designers to create the perfect design solution in a single attempt. Instead, the design solutions should be refined based on evaluations. In iterative development, prototypes[17] are used to test and evaluate design solutions. After a design is completed, it is evaluated, preferably together with users, and the results are used to create new designs that are tested again. This cycle of analysis, design, evaluation, and redesign based on the feedback is repeated until predefined objectives are met. In this way, the understanding of the users' needs increases during the development process and the design process becomes self-correcting. (Gulliksen & Göransson, 2002, p.106ff) (Hartson, 1998)

#### 3.3.3.1 12 key principles of the user-centered process

Gulliksen et al (2003) have proposed 12 key principles that define what should be included in a user-centered process. The principles are intended to guide the user-centered design processes and to make it easier to maintain focus on usability and users, but could also be used to assess whether a development process is user-centered or not. They cover all the

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[17] A prototype is defined by Preece et al (1994) as "an experimental incomplete design of an application used for testing design ideas".  (Preece et al, 1994, p.718)

phases usually present in a development process: analysis, design, evaluation, construction and implementation. (Gulliksen et al, 2003) The principles are:

- *User focus – the goals of the activity, the work domain or context of use, the users' goals, tasks and needs should early guide the development.* During the whole process the focus should be on users' needs rather than on technology. For this to happen, all project members should meet users and gain an understanding of the users' characteristics and tasks, and of the context of use. User-centered activities, such as contextual inquiries[18], creating user profiles[19] and task analysis[20], must be part of the process.

- *Active user involvement – representative users should actively participate, early and continuously throughout the entire development process and throughout the system lifecycle.* Users, representative for the intended user groups, should be directly involved in the development activities as well as in for example designing new work practices.

- *Evolutionary systems development – the systems development should be both iterative and incremental.* Since it is not possible to know from the start exactly what to build, design solutions have to be iterated with users. Iterations should consist of a user and needs analysis, a design phase, evaluation with suggestions for modification, and redesign according to evaluation results. Incremental development means that the system is delivered in parts instead of delivering the whole system in one piece. The increments are iterated with users until specified goals are met.

- *Simple design representations – the design must be represented in such ways that it can be easily understood by users and all other stakeholders.* Relatively simple representations such as prototypes in the form of paper sketches or simulations are the most suitable ways to communicate the proposed design solutions.

- *Prototyping – early and continuously, prototypes should be used to visualize and evaluate ideas and design solutions in cooperation with the end users.* Prototyping should start before implementing anything in code, and should continue throughout the whole process. Paper prototypes should be used early in the process to visualize ideas and get early feedback on conceptual design. Prototyping should not only be used for evaluating, but also as a way for users to participate in the design.

- *Evaluate use in context – base lined usability goals and design criteria should control the development.* Specify usability goals and base the design on specific design criteria. The design should be evaluated in context, with users, against the specified goals.

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[18] Contextual inquiry is the first part of contextual design, which is described by Beyer and Holtzblatt (1998). The main part consists of contextual interviews, which are focused interviews with users in the context of use. This means that users are interviewed and observed at their workplace, while they work. The goal is to understand the users' needs and approaches to work, but also the context in which the system will be used.

[19] User profiles are descriptions of different user groups. For each user category some relevant characteristics are listed. This could for example include experience of using computers, education level, if there are any physical limitations to consider when designing the system, and the users' tasks or goals with using the system. User profiles can also include information about the context of use, such as the type of environment in which the system will be used.

[20] Task analysis is a technique that can be used to define and analyze the tasks which users of a system perform. It identifies what users do and how the tasks are done, for example the different steps or actions that are necessary to achieve the goal of a task.

- *Explicit and conscious design activities – the development process should contain dedicated design activities.* To the users, the user interface is the system. Therefore the interface design is critical to how the users perceive the system. The user interface and interaction design should not just 'happen', but be a result of professional interaction design.
- *A professional attitude – the development process should be performed by effective multidisciplinary teams.* System development is a multidisciplinary activity requiring a number of different skills. The work should be performed by a team consisting of for instance system architects, programmers, usability designers, interaction designers and users.
- *Usability champion – usability experts should be involved early and continuously throughout the development lifecycle.* In all development teams and throughout the whole process, there should be an experienced usability expert who is responsible for usability efforts and who has the authority to make decisions on matters affecting usability.
- *Holistic design – all aspects that influence the future use situation should be developed in parallel.* Especially when developing systems that are to be used in a workplace, it must be recognized that the system will affect the work organization, work practices, and so on. These aspects, also including hardware, manuals, user training, and safety aspects, must be developed in parallel with the software.
- *Processes customization – the UCSD process must be specified, adapted and/or implemented locally in each organization.* No process fits all organizations and projects. Therefore the details of the UCD process, the exact methods and activities used, must be chosen depending on the needs of the project and the organization.
- *A user-centered attitude should always be established.* Everyone who is involved in the project must be aware of the importance of UCD and usability.

Gulliksen et al (2003) acknowledge that it is difficult to apply all the principles at once when an organization wants to start working user-centered. Instead, the principles will have to be implemented gradually, but the aim should be to follow all of them, and it is important to comply with them as much as possible. (Gulliksen et al, 2003)

### 3.3.4 UCD in China and the Western countries

In the Western countries, much of the pioneer work within UCD was done in the 1980s when the basic ideas were introduced. (Göransson, 2001) UCD has gained more attention in recent years, and the importance of focusing on and involving users in system development in order to achieve usability is now well recognized. (Kujala, 2003) (Liu et al, 2002) (Stary, 2002) It is also beginning to get more accepted in industry, but the degree to which organizations have adopted UCD practices is still varied. (Gulliksen & Göransson, 2002, p.24)

In comparison, in China the concept of HCI was introduced during the 1990s, followed only in the last few years by the concepts of usability and user-centered design.[21] According to Liu

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[21]   However, certain parts of what is today counted as HCI, such as ergonomics and human factors, have been acknowledged much earlier. (Wang, 2003)

(2005), in 2005 there were about twenty institutions working with HCI. This includes for example computer science, industrial engineering and psychology departments in universities, industrial research and development departments and research institutes. There are still only a few universities that offer HCI courses. (Liu, 2005) Compared to the Western countries, less basic HCI research is done in China, and the links between academic HCI research and the software development methods used within the industry are still relatively weak; research results do not directly influence the development work. The Chinese IT industry is, however, beginning to become more aware of the importance of usability, and large multinational companies are beginning to establish their own research centers. (Wang, 2003)

Usability organizations, such as the Usability Professionals' Association (UPA), have also been founded in the last few years[22]. The number of usability professionals is, however, still limited (Wang, 2003). According to the president of UPA China there are currently around 500 usability professionals working in China, but he estimates that only about 20 of them are 'real' usability professionals with interdisciplinary knowledge and real usability expertise. (Chauhan, 2006)

An earlier study by Liu et al (2002) identified some of weaknesses of usability work in China at that time. Liu et al studied three software companies in the Dalian region and conducted an assessment of their usability maturity[23]. All of them were found to be on the lowest usability maturity level. According to Liu et al, the companies represented the advanced level in the software industry and this result therefore should indicate the maturity level of the majority of the leading IT companies in the country. The organizations did not see usability work as a normal part of their routines, and they still lacked multidisciplinary teams which could promote usability issues. One problem discussed in their study was that almost all of the employees in development departments were trained in computer science or other related technology oriented specialties, which meant that there was a lack of people with backgrounds in for example psychology or ergonomics. (Liu et al, 2002)

The developing organizations also often partly blamed usability problems on the users: the users' requirements were for example considered not specific enough or changing too often, with the result that the organization finally ignored many of these requirements. Other weaknesses were the communication with users, which usually happened only at certain stages such as feasibility analysis, requirement specification and testing, and that very few activities involving users took place during the design phase. Users were sometimes asked to participate in the end of the development, when reviews were done. There were no well-established rules for how user involvement should be handled. When prototyping was used, users were rarely asked to use the prototype for real tasks; instead it was normally used for demonstrations. (Liu et al, 2002)

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[22]  UPA China was founded in April 2004 (UPA China, n.d.), whereas UPA in the USA was founded in 1991. (DFW UPA, n.d.).

[23]  They conducted an assessment using the same model that we have used for our assessment of the companies' usability maturity. For details about the model, see chapter 5.5 and appendix B.

## 3.4 Why are HCI, usability and UCD important?

There have been attempts to show the value of UCD by cost-benefit analyses, for example by Karat (1993), but it should be admitted that it is difficult to measure benefits of UCD and usability in financial terms. As Göransson (2004) states, the main problem with this kind of analysis is that it is very difficult to correlate overall effects with a single development activity. Instead, arguments for UCD are usually based on experiences from development. Göransson also points out that it is logical to assume that if users are focused on and involved in the development process, the system will be better suited to their needs than if they are excluded from the process. This means that UCD methods should be seen as an investment that will give more in return in the long-term perspective. (Göransson, 2004)

There are many arguments for focusing on usability and for applying HCI knowledge and UCD methods in system development. Some of the potential benefits are mentioned below.

### 3.4.1 Benefits for system users

The obvious benefit for system users is that they have the opportunity to get a system that is better adapted to their needs and consequently they will be more satisfied with the result. (Kujala, 2003) When systems are developed to be used at a workplace, health is another important issue. Many occupational health problems are correlated with poor usability. This is of course a problem for the users themselves, but health problems are also costly for the employers. By developing systems that are more usable and suit the users' limitations and capabilities better, the risk for health problems could be reduced. (Göransson, 2004)

A third reason for applying HCI and UCD knowledge is that it can be used to reduce the risk for errors that can have serious consequences. Human errors are often in part caused by poor usability. (Maguire, 2001) For example, plane and train accidents have been attributed to interface design faults. (Benyon et al, 2005, p.24) (Cooper, 1999, p.3f)

### 3.4.2 Benefits for the buying company

UCD can be used to reduce costs. For example, by using UCD methods to find out users' real needs a product that has only the relevant functionality can be produced, and this way development costs can be reduced. (Mauro, 2002) If it is made more usable and designed in a way that suits the users, training costs and the need for support can also be reduced. (Maguire, 2001) (Göransson, 2004)

If the systems can be made more usable, it will allow users to work more effectively, which would lead to increased productivity. (Maguire, 2001) (Bevan & Bogomolni, 2000) It would also help reducing the risk for employee errors that could be costly for the organization. (Bevan, 2005) Systems that are not liked are likely to be underused, but if users are involved in the design, they will feel that they have taken part in designing the system, which will make it more likely that they accept it. (Benyon et al, 2005, p.24f) (Göransson, 2004)

### 3.4.3 Benefits for the developing company

User involvement has been identified as one of the most important factors for project success.

(Standish Group, 2001) It is often said that time to market is important. However, as Cooper points out, "shipping a product that angers and frustrates users in three months is *not* better than shipping a product that pleases users in six months". (Cooper, 1999, p.41) Finding out what users really need, before developing a product, reduces risk of product failure. (Bevan, 2005) (Göransson, 2004) Involving users from the beginning of the process also makes it easier to detect usability problems early, and to prevent problem from occurring. This is less costly in terms of money and time than finding and correcting problems when the product is almost finished. (Bevan & Bogomolni, 2000) (Kujala, 2003)

Sales can be increased by developing products that can be marketed as more usable, since this makes them more competitive compared to other products in the market. (Bevan, 2005) Since many countries have requirements stating the importance of usability, these issues should be important to address for companies which target international markets. (Göransson, 2004)

## 3.5 Other aspects: Acceptability and accessibility…

Most members of the HCI community seem to agree that usability is the main goal of system development. However, some argue that usability is only one of the attributes that contribute to the overall quality of the system, and that there are also other attributes to consider when developing interactive systems. (Nielsen, 1993) (Benyon et al, 2005, p.51ff) A perceived need for approaches that focus on other aspects has lead to the emergence of new concepts such as acceptability and accessibility.

Acceptability refers to how a system fits into people's lives. It covers such things as if a system is politically acceptable and if people trust it, as well as economic issues, for example if the system is perceived as offering value for money. It also covers cultural and social habits, which concerns the way people want to live. For a system to be accepted by potential users, it should not violate cultural or social norms. (Benyon et al, 2005, p.60)

Accessibility has developed to be a key concern of system design today. Accessibility is defined in ISO 16071 as "the usability of a product, service, environment or facility by people with the widest range of capabilities". (Gulliksen & Göransson, 2002, p.87) It includes taking into account the special needs of for example people with disabilities, elderly and children. Barriers to access can be physical or cognitive, but also cultural. An example of cultural exclusion is if designers use metaphors that are only understood by people from a certain country or culture. (Benyon et al, 2005, p.52ff)

### 3.5.1 … completed with a cultural approach

What is missing in these approaches is a more explicit focus on culture. In usability definitions such as the ISO 9241 definition it is pointed out that user groups differ in characteristics and needs, but the role of culture or how to take into account cultural differences is not explicitly discussed. Both acceptability and accessibility acknowledge that culture is important, but neither of them seems to emphasize cultural issues. Accessibility, for instance, in practice seems to focus more on removing barriers that exclude people with physical disabilities.

The 'traditional' user-centered methods and theories also rarely discuss cultural issues, although they stress that it is important to consider the differences between user groups. Some have argued that because of this, 'traditional' UCD is not enough. For example, Prior et al (2006) claim that there is a need for a more cultural approach that could be complementary to the existing approaches to design.

# 4 Culturability

*In order to extend the concepts of usability, acceptability and accessibility into a more multinational context, the term 'culturability' has emerged. To understand why the 'traditional' usability matters should be extended with a notion of culture, it is important to understand what the word 'culture' means and how culture affects people. This chapter presents some interesting and important features of culture and a comparison between cultures in the West and in China.*

The concept of culturability combines 'traditional' usability with culture to fit into a more sociological context. Culturability is defined as "a term we use to emphasize the importance of the relationship between culture and usability in WWW design, but it can be expanded to apply to any software designed for international use". The idea behind culturability is that culture is a main determining factor for the usability of a system intended for international audiences, and that for this reason usability issues should not be discussed separately from cultural issues. The term 'culturability' is used instead of 'usability' to emphasize this focus on the importance of culture. (Barber & Badre, 1998) Within culturability, 'cultural markers', such as religion, language, customs, color, metaphors, icons and flags, are used to facilitate user performance. (Prior et al, 2006)

## 4.1 Definition of culture

According to Iivari (2005), "Culture is an ideational, symbolic system that consists of learned, shared, patterned sets of meanings or cognitions. Culture refers to the patterns for behavior that guide the action of the cultural members. Culture necessitates aspects such as collective identity, shared history and experiences, and common frames of reference for sense making." It can be defined as historical, which includes values, beliefs and norms that guide members of the culture, and as an abstraction from cultural members' behavior. It is also something that is learned. (Iivari, 2005) Culture has also been described as "the collective programming of the mind that distinguishes the members of one group or category of people from others". (Hofstede & Hofstede, 2005, p.4)

Cultural identity refers to understanding the core values and traditions of a given culture. (Arasaratnam & Doerfel, 2005) Peoples' lives are formed by their cultural identity. Cultures differ in many ways, and there are also several ways in which these cultural differences manifest themselves. Hofstede and Hofstede (2005) have identified four aspects that are intended to cover the total concept of culture: *symbols*, *heroes*, *rituals*, and *values*. These manifestations of culture can be described as an 'onion' with the four aspects on different levels of depth, as shown in figure 4. Of the four aspects, the most superficial culture manifestation is symbols, followed by heroes, rituals, and finally values. (Hofstede & Hofstede, 2005, p.6ff)
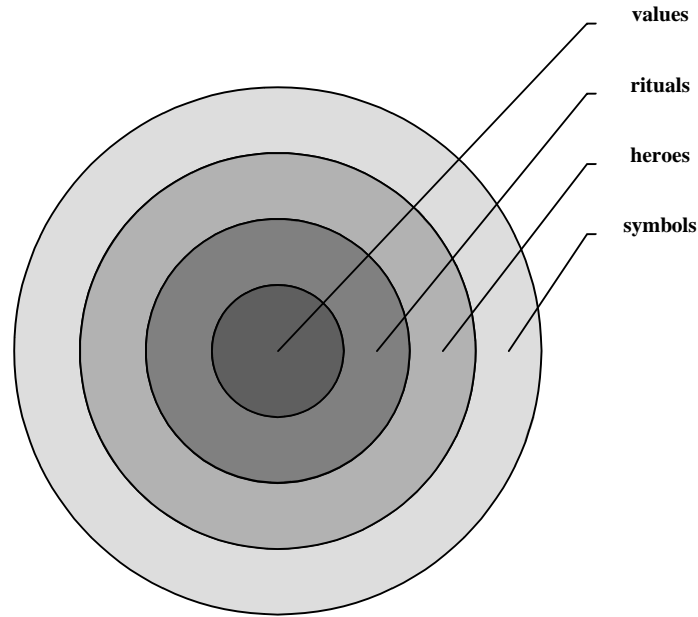
*Figure 4 - The 'onion': manifestation of culture at different levels of depth. Source: Hofstede and Hofstede (2005).*

*Symbols* are described as "words, gestures, pictures, or objects that carry a particular meaning only recognized as such by those who share the culture". Symbols are easily adapted from one culture to another. *Heroes* represent persons who function as role models because they possess certain characteristics that are highly valued in the culture. *Rituals* are collective activities which are considered socially essential within the culture. Examples of rituals may include ways of greeting and ways of acting during social and/or religious ceremonies. The core of a culture consists of *values,* which are defined as "broad tendencies to prefer certain states of affairs over others". Many of them remain unconscious to us, because we acquire them early in our lives. Values are difficult to be discussed or observed by outsiders, since the people within the culture just 'know' or 'feel' how to do the right thing. (Hofstede & Hofstede, 2005, p.7f)

### 4.1.1 Culture's influence

Our culture influences most aspects of our lives. For example, it affects how we approach problems and how we participate in groups or communities. It influences the ways we interact with each other in everyday life, how we do business, make important decisions and take responsibility, deal with conflicts and show respect toward other people, laws and regulations, and the society. Peoples' ways of communicating also vary between cultures. In different cultures, words, phrases, facial expressions and gestures can have different purposes. This, of course, could cause misunderstandings between people belonging to different cultural groups. (DuPraw & Axner, 1997)

The ways of dealing with conflicts also differ. In some cultures conflicts are dealt with through a straight confrontation, whereas in other cultures open conflict is experienced as

embarrassing and best worked out quietly. Showing emotions or the reasons behind a conflict is also considered inappropriate in some cultures. There are also different ways in which people move toward completing tasks. In Western cultures, for example, the work is more task-oriented, whereas in Asian cultures the importance lies in relationship-building. In both cultures the goals are achieved equally effectively, but the approach is different. (DuPraw & Axner, 1997)

## 4.1.2 Hofstede's cultural dimensions

A lot of studies have been conducted over the years, in an attempt to identify differences between cultures. One of the most well known was conducted by Professor Geert Hofstede, who performed a comprehensive investigation including around 16 000 IBM employees from different parts of the world. This work was conducted in over seventy countries between the years 1967 and 1973. The aim of this study was to see how the cultures in respective countries affect the values of people in a workplace. Based on this study Hofstede identified four, later followed by a fifth, cultural dimensions[24]. These dimensions indicate the probable reactions of an individual in different situations and contexts.

- **Power Distance Index (PDI)** is defined as "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally". (Hofstede & Hofstede, 2005, p.45) A higher ranking therefore indicates that a higher degree of inequality is accepted, while a lower ranking indicates that equality is seen as the ideal. (Hofstede, n.d.)

- **Individualism (IDV)** is about the "degree the society reinforces individual or collective achievements and interpersonal relationships". A high ranking indicates a more individualistic culture which stresses individual rights. A low ranking is typical for collectivist societies. In collectivist cultures, people often belong to strong groups where everyone takes responsibility for other group members and there are close ties between individuals. (Hofstede, n.d.)

- **Masculinity (MAS)** focuses on the "degree the society reinforces, or does not reinforce, the traditional masculine work role model of male achievement, control, and power". High MAS rankings mean that there is a high level of gender differentiation and that males dominate in the society. In contrast, low rankings indicate a low degree of differentiation between genders, and that females are seen as equals to males. (Hofstede, n.d.)

- **Uncertainty Avoidance Index (UAI)** indicates the "degree of tolerance for uncertainty and ambiguity within the society - i.e. unstructured situations". In a high-ranking country, people have low tolerance for unfamiliar situations and uncertainty. Typical for these societies is that they are rule-oriented and try to reduce ambiguity by relying on strict formal laws, rules, controls and regulations. In countries with low UAI rankings, people are more comfortable with uncertainty. Compared to high-ranking countries, these societies are less rule-oriented, show more tolerance for different opinions, and find it easier to accept changes and risks. (Hofstede, n.d.)

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[24] A dimension is described by Hofstede and Hofstede as "an aspect of a culture that can be measured relative to other cultures". (Hofstede & Hofstede, 2005, p.23)

- **Long-Term Orientation (LTO)** (a special dimension which was developed based on the Chinese culture) focuses on "the extent to which a society exhibits a pragmatic future oriented perspective rather than a conventional historic or short term point of view". A culture with high LTO score takes a long term view, readily accepts change, and believes that there are many truths. Cultures scoring low are more focused on short-term results, are more conventional, and believe in absolute truth. (Hofstede, n.d.)

## 4.1.3 The Chinese culture

It is sometimes said that China is Westernizing and that cultural differences, as a consequence, are becoming less important. However, a perhaps more correct description is to say that China, or at least its bigger cities, is modernizing. Underneath this, the traditional Chinese cultural values are as important as ever. (Chee & West, 2004, p.43)

The Chinese culture has evolved for more than 2 500 years, and can be described as the world's longest shared culture. It has been heavily influenced by three forces or beliefs: Confucianism, Taoism and Buddhism. The result is what has been described as a culture of humanism, in which the way of life is both practical and philosophical. (Wah, 2003, p.3ff) Of these three forces, Confucianism could be considered the most influential. The values of Confucianism have been dominating the Chinese culture during most of its existence, and as a result, most aspects of Chinese life are in some way based on, or influenced by, Confucian ideas and ethics. (Chee & West, 2004, p.3) The doctrine of Confucianism is still influencing the Chinese culture not only in mainland China but also in overseas Chinese people. (Wah, 2003, p.40) Because of this strong influence, understanding Chinese culture also requires understanding something about Confucianism.

### 4.1.3.1 Confucianism

Confucius was a wandering scholar who lived in 551-479 BC. Confucianism, his teachings, became state teachings in 202 BC, and this continued until 1911 when the imperial period ended. (Halsall, 1995) It was not originally intended to be a religion, but rather should be thought of as lessons in practical ethics. (Hofstede & Hofstede, 2005, p.208) Confucianism was most of all concerned with proper conduct, social relations and harmony. (Halsall, 1995) The importance of collectivism, stability and the respect for tradition was emphasized. Most influential, however, has perhaps been his view on hierarchical relationships. (Chee & West, 2004, p.45)

Some of the key principles are the following:

- *The stability of a society is based on unequal relationships between people*. Confucius defined five basic types of relationships. These were the relationships between ruler and subject, husband and wife, parent and child, older and younger brothers, and older and younger friends. These can all be seen as unequal relationships between superior and inferior. At the same time, the relationships are based on mutual obligations. While inferiors owe superiors respect and obedience, superiors for example owe inferiors protection.

- *The family is the prototype of all social organizations.* In Confucianism, a person is first of all seen as a member of a family and only second as an individual. Since group membership is emphasized, it is also important to maintain harmony within the group. One way to do this is to make sure that everybody maintains face, meaning that they maintain a certain degree of self-respect, dignity and prestige. Therefore it is seen as important to act in such a way that nobody loses face.
- *Virtue with regard to one's tasks in life consists of trying to acquire skills and education, working hard, not spending more than necessary, being patient, and persevering.* The ideal is, in all things, moderation.

(Hofstede & Bond, 1988)

### 4.1.3.2 Face

An important concept in Chinese culture is 'face', which, as mentioned earlier, is related to the Confucian principle of preserving harmony. Face has to do with one's self-respect, prestige and standing in the group. Traditionally in China, losing dignity has been considered equivalent to losing one's nose, eyes and mouth (Hofstede & Hofstede, 2005, p.208), and the notion of face could therefore be said to go far beyond the Western 'sense of dignity'. Rather, it is seen as a central part of what holds the society together. (Chee & West, 2004, p.48f) Within inter-personal relations, harmony, tolerance, trustworthiness, non-competitiveness, and conservatism are preferred. In order to maintain these, aggressive and confrontational behavior is strongly discouraged. (Wah, 2003, p.8)

Individuals as well as organizations and countries have face. It is something one can give to others, or that can be lost.  Face can be gained by good connections, wealth, power or intelligence, but it is also dependent on behavior. For example, by paying respect to others both parties gain face. It can be lost by publicly insulting someone (in which case both parties lose face), cultural insensitivity, refusing a request or turning down an invitation without having a good excuse, or losing self-control by displaying anger or aggression. Losing face means not only losing prestige, but also less social capital to use in developing networks. The notion of face is therefore also related to another important concept in Chinese culture, 'guanxi'. (Chee & West, 2004, p.48ff) [25]

## 4.2 Culturability – product design and development

Since the international market is usually bigger than the domestic one, many companies today are marketing their products not only in their own country but also abroad. For software design, this means that it is necessary to take into consideration the cultural diversity of potential users. (Ford & Gelderblom, 2003) This has lead to increasing interest in how culture influences the design of software systems, and many HCI researchers today are focusing on culture matters and addressing it as an important factor that can affect user satisfaction and performance. (Noiwan & Norcio, 2006) The majority of the research within the area of culturability focuses on interface design and on how to adapt websites to suit users from

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[25]  Guanxi will be disussed further in chapter 5.3.1.1.

different cultures. Some examples of such research include Rau & Fang (2003), Hu et al (2004), Marcus & Gould (2000) and Simon (2000).

## 4.2.1 Localization – more than translating text

Research within HCI and culture concerns for example how visual interface elements such as icons, menus, colors and buttons are percepted by users in different cultures. This is important for the localization of software systems that are to be used in different countries. Localization can be considered a parallel trend to user-centered design (Hillier, 2003) and refers to the process of developing a special version of a product for a specific market. (Pack, 2003) Until recently, localization efforts have mainly concentrated on translating text and changing features such as date and time formats, weights or addresses to fit the target culture. (Ford & Gelderblom, 2003) However, since people from different cultures have different ways of thinking and perceiving the world and also different values (Rau et al, 2004), localization must also take into account such things as selecting suitable metaphors, images, logic and communication patterns. Even very subtle cultural nuances should be attended to in order to develop a product that is usable in the other culture. (Sun, 2001)

As we have discussed earlier, symbols are one of the manifestations of culture and they carry a meaning which is only recognized by people who are members of that culture. (Hofstede & Hofstede, 2005, p.7) Symbols such as words, pictures, colors and metaphors are used in interfaces to make the user experience easier and richer. However, a problem is that the majority of software is developed in, or at least contracted by, the USA. Since much of the software is primarily developed with the American market in mind, interfaces are also mainly based on metaphors, navigational logic, color associations and representations that suit the American culture. Often the design of those interfaces ignore that color associations and text layouts differ between cultures, or that other cultures may feel more sensitive about some numbers, visual representations or words. Therefore cultural requirements should be the basis for development or adaptation of interfaces, and representatives of the culture in which they will be used should preferably participate in the process. Only through better understanding of the intended users' cultural values is it possible to meet their true needs and develop interfaces that are easy to use, simple and enjoyable, sensitive with regard to user's cultural context and which make users' experiences more meaningful. (Prior et al, 2006)

## 4.2.2 Culture affects perceived usability

Asian and Western cultures are different in several ways, and many of these differences are relevant to usability and system design. Previous studies have shown that the color associations and the thought processes of Chinese and Americans are different, and these differences could impact on the perceived usability of the systems if they are not taken into account in the design process.

According to Fang and Rau (2003), one difference concerns how members of the groups categorize things. While Americans have a tendency to classify things by analyzing components and inferring common features, Chinese in general prefer to classify on the basis of thematic relationships and family resemblance. (Fang & Rau, 2003) Western people, compared to Asians, are inclined to focus on objects, believe in stability, and rely on rules

based on logic. In contrast, Asians are more likely to pay attention to relationships and context and to believe in constant change. They are also in general more comfortable with apparent contradictions. (Nisbett & Masuda, 2003)

Another example of the differences between cultures concerns people's color associations. Physically, people percept colors in the same ways (Eysenck & Keane, 2000, p.38ff), but the way people respond to colors is to a large extent culturally dependent (Noiwan & Norcio, 2006). Some examples of the different color associations of Chinese and American culture representatives are shown in table 1. For example, the color red, which in the Western cultures is used to indicate potential risks or problems, is in China associated with happiness and therefore could be interpreted by Chinese users to have a totally different meaning, leading them to ignore potential dangers.

An example of differences concerning color associations is ticket gates to Shanghai subway. On top of the ticket gate are indicators that show the color green when the gate is available for the next passenger to walk through. The moment the passenger registers her ticket the color indicator turns red, indicating 'go'. This seems to cause confusion among Western users, since they usually interpret red as a warning signal or 'stop'.

| Color | China | USA |
|---|---|---|
| Red | Happiness | Danger, stop |
| Blue | Heavens, clouds | Masculine |
| Green | Ming Dynasty, energy | Safety, go |
| Yellow | Birth, wealth, power | Cowardice, temporary |
| White | Death, purity | Purity |

*Table 1 - Examples of color associations in China and the USA. Source: Barber and Badre (1998).*

## 4.2.3 Culturability and product development processes

In order to design a system that is culturally optimized, it is necessary to understand how existing systems in a country or culture are built within, and for, that particular target culture or sub-culture. However, culturability issues do not only concern the user interface or interaction, but also the methods used for developing systems. Cultural differences are therefore potentially relevant to both design and the design process. (Smith et al, 2004)

As has been argued earlier, it is only by studying real users in their real environments that development teams can make sure that the real needs of the users are found. However, it should be considered that the 'traditional' methodologies and techniques for user-centered design and user participation might not be usable in other cultures. For example, the 'traditional' methods of user testing may be challenged when operating in different cultures, when problems with successfully engaging with users from different cultures may occur. The assumptions underlying user-centered design are derived from Western cultures, but those assumptions might not be valid in other contexts. (Smith et al, 2004)

It is also possible that not all usability criteria or guidelines developed from a Western perspective are suitable for using in other cultures (Hillier, 2003). Because people from different cultures perceive things differently, different usability criteria might be more or less important in different cultures. Chinese users, for instance, might value some characteristics of a system higher, compared to Western users, while having more tolerance for certain kinds of usability deficiencies.

## 4.3 Comparison between cultures

As we have argued, there may be some problems with using 'traditional' usability methods in non-Western countries such as China. In order to understand if and how these techniques need to be changed to better suit the Chinese culture, an important first step would be to understand how the Chinese culture differs from the Western and in which ways these differences could affect usability work issues. In the following section we will therefore compare these cultures using Hofstede's dimensions and discuss how this could be of relevance for usability work.

Western cultures are here represented by Scandinavia[26] and the USA. The reasons for choosing these countries are that most software companies and many usability methods are of North American origin, and that it can be argued that several of the ideas behind UCD, for example the idea that users should have a right to participate in the design, are based on Scandinavian values[27]. Another reason for including Scandinavia is that our home culture is Scandinavian.

The figures 5-7 illustrate the countries' scores on Hofstede's five dimensions. As can be seen in the figures, the Western cultures' scores are relatively similar, except for the masculinity dimension. The most noticeable differences when the Western countries are compared to China concern the two first dimensions, power distance and individuality. China and the USA also have very different LTO scores. The LTO score is not specified for Scandinavia as a whole. However, the individual Scandinavian countries score relatively low. Comparing LTO scores, Norway, Finland and Sweden rank on places 13, 16 and 23 of the 39 countries for which the LTO score has been calculated, whereas China ranks on first place and the USA on place 31 (Hofstede & Hofstede, 2005, p.211).

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[26]   Scandinavia is in this context defined as including Norway, Sweden and Finland, since this definition is consistent with the definition by Hofstede.

[27]   For example, Participatory design, also known as the 'Scandinavian school', stresses democratic participation in developing systems that will be used for work. Participatory design is based on the idea that users should not only be participants, on equal terms with the developers, in the whole development process, but actually be in control of the process. A key idea is that users have democratic and legal rights to participate and influence what their new work situation will be like. (Göransson, 2001) (Kujala, 2003)
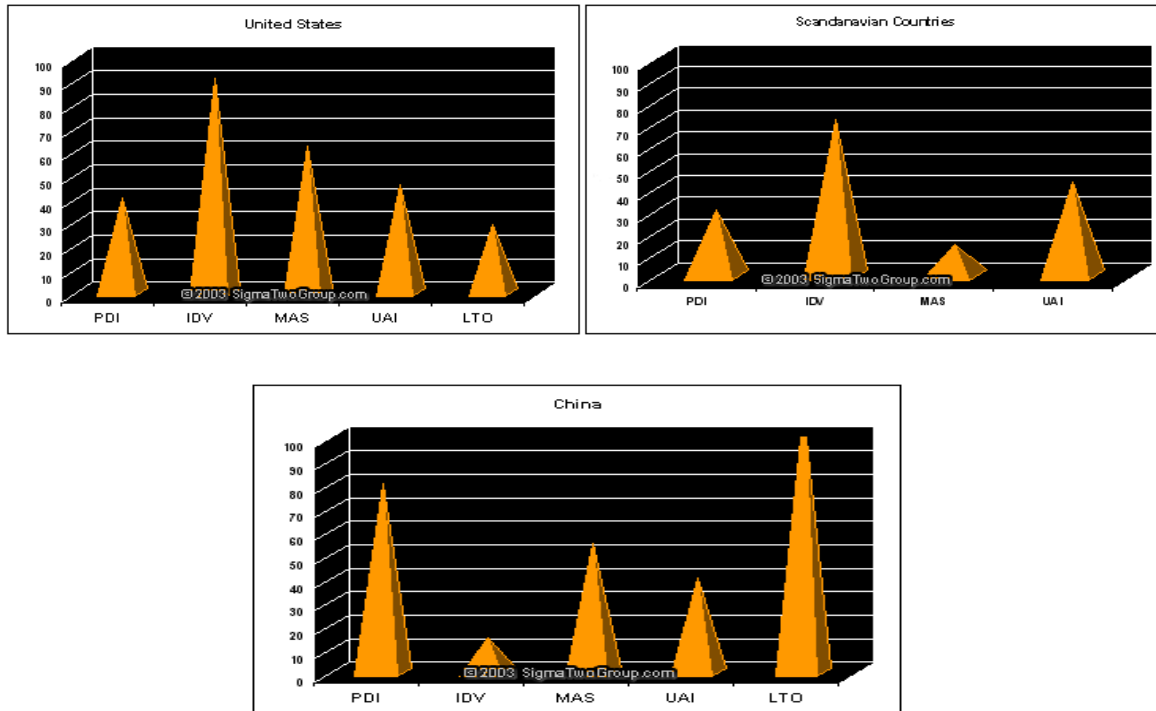
*Figure 5 - The Chinese, the USA and the Scandinavian scores on Hofstede's cultural dimensions. Source: Hofstede (2006a, b, c)*

## 4.3.1 Implications for usability work

As we stated earlier, culture influences the human behavior in different situations. The dimensions indicate some probable reactions of an individual in different situations and contexts, including work environments and the way companies are managed. Since our focus is on companies' work methods, we will, in the following chapter, discuss how these dimensions directly or indirectly affect the way usability work is being carried out.

### 4.3.1.1 Power Distance Index (PDI)

China ranks high on the PDI scale, compared to the USA and Scandinavia. This higher ranking indicates that power is distributed unequally in China, while it is less so in the Western countries.

In countries scoring high on the PDI scale, workplaces are hierarchically structured and power is centralized. Subordinates are expected to follow orders without questioning. Workplaces in countries scoring low, on the other hand, are usually less hierarchical and power is relatively decentralized. Relations between superiors and subordinates tend to be more equal, and even though the final decisions are made by superiors, subordinates expect to be allowed to take part in discussions when decisions affecting their work situation are being made. (Hofstede & Hofstede, 2005, p.55f)

These differences imply that people from cultures such as the Chinese could be less likely to approve of some of the 'traditional' usability methods. These methods were developed in

cultures with fairly low power distance scores. In low-power-distance cultures such as the Scandinavian, employees often expect to be consulted before important changes take place. The Swedish work law, for example, states that workers should be given the possibility to participate in the design of their work situation and in changes that concern work (Gulliksen & Göransson, 2002, p.28). An example of such a situation is the development of a new system. In a culture where power is more centralized and employees are not supposed to take part in decision-making, people, and especially employers, might not share the view that employees have the right to participate in the development of systems that they are going to use.

This might lead to another problem: access to end users. Getting access to users can sometimes be difficult even in Western countries (Boivie, 2005), but it is likely that this problem could be even worse in a high-power-distance culture such as China, especially if end users are low in the hierarchy. Since superiors normally make the decisions in these cultures, they might show less understanding for the idea that end users should be consulted during the different phases in the development process.

**4.3.1.2 Individualism (IDV)**

Scandinavia and the USA rank quite high on the IDV scale, whereas China ranks low. A low ranking means for example that loyalty toward the group is important and that the interests and needs of the group are considered more important than those of the individual. In exchange for unquestioning loyalty, the group offers protection. People in more individualistic countries, in contrast, are less dependent on the group and individual interests take precedence over those of the collective. (Hofstede & Hofstede, 2005, p.74ff)

As a consequence of this importance of group membership, individuals in most collectivist countries are not expected to have opinions that differ from those of the group they belong to. (Hofstede & Hofstede, 2005, p.87) This could also be said to be true for China. Traditionally, Chinese people have not been encouraged to think for themselves. One explanation for this is the hierarchical system discussed earlier, which includes a deferential tradition toward old people and a tradition of paternalism which states that authorities should be obeyed. (Chee & West, 2004, p.122) Even today, employees who are 'forward' for example by making innovative suggestions risk being seen as too ambitious, and Chinese managers could perceive this as an attempt to take over their position or make them lose face. (Chee & West, 2004, p.128f)

User-centered methods presuppose that users participating in for example testing are used to discussing and arguing. The methods require users to participate actively and criticize. This works fairly well in Scandinavia, but it is not evident that methods such as think-aloud[28] are suitable for testing with Chinese users. (Nielsen, 2006) If people are less used to giving their own opinions, that could make it more difficult to get feedback on for example a new interface design.

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[28]  A technique applied in user testing where users are asked to tell what they are thinking or feeling while they interact with the system and perform different tasks.

This difference between emphasizing the individual and emphasizing the group could also have consequences for usability work. In collectivist societies where it is perceived to be important to preserve harmony within the group, direct confrontation is generally seen as rude (Hofstede & Hofstede, 2005, p.87). In China, frankness in communication is also usually considered impolite. (Chee & West, 2004, p.90) This is a potential problem for many usability testing methods. For example, in many Asian cultures it is considered impolite to tell someone that his/her design is bad, and this, of course, makes it more difficult to get feedback on design ideas. (Schaffer, 2004) The problems with getting feedback in Chinese organizations is also discussed by Chee and West, who claim that people in China tend to say what they think the other person wants to hear. This is partly because it is a way to preserve harmony and partly because criticizing someone could make that person lose face. The Chinese are especially reluctant to give criticism in groups. (Chee & West, 2004, p.129f)

Although these things can be a problem in many cultures, since people often want to be polite and sometimes tend to say what they think would be the 'right' answer, it is probably more so in a highly collectivist culture such as the Chinese. Since both criticism and praise in China should be given in private, if at all (Chee & West, 2004, p.55f), and since people tend to avoid things that make them stand out from the group or show that they have different opinions from the rest, this could for example make it more difficult to get everyone's opinions and ideas in focus group[29] discussions.

### 4.3.1.3 Masculinity (MAS)

China and the USA rank almost equally on the MAS scale, and both countries rank rather high. Compared to this, Scandinavia ranks relatively low. In other words, in this case the difference is not between Western and Chinese culture, but between USA/China and Scandinavia.

In countries ranking high, competition is typically harder, work is more important to a person's identity, organizations are larger, management is more aggressive, and at work people generally value opportunities for advancement higher than good relations to colleagues.[30] For low-ranking countries, the opposite is true. Countries are generally better at activities that suit the cultural values, and therefore masculine cultures are usually good at fast industrial production in large volumes. More feminine cultures, on the other hand, are usually better at manufacturing according to customer specification, and are successful in service industries such as consulting. (Hofstede & Hofstede, 2005, p.143ff)

If feminine cultures generally are better at customization, it could be assumed that in these cultures user-centered principles more easily would be understood and accepted. However,

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[29]  Focus groups are groups of stakeholders that are gathered to discuss a specific topic. Participants are asked about opinions, feelings, attitudes and ideas concerning the topic of discussion. This method can be used for example in the requirements phase, when participants discuss what they need of the new system. It can also be used to get information that can be used as input to the design work, or to get feedback on a proposed design. The idea is that participants should not only answer questions but also react to each others' ideas.

[30]  If the country ranks high on the MAS dimension but at the same time is highly collectivist (low IDV rank), the collectivist values could make some of these things more difficult to notice; for example, in a collectivist country such as China, competition would be less open than in a more individualistic country like the USA.

since many user-centered methods are of American origin and the USA and China have similar MAS ranks, differences on this dimension should be of less relevance to usability work. Yet the Scandinavian countries differ from both the USA and China, and since a lot of the usability research originates from the Scandinavian countries, even this dimension could make a difference.

### 4.3.1.4 Uncertainty Avoidance Index (UAI)

All the countries rank almost equally on the UAI scale, and they all rank relatively low. A low UAI score means for example that tolerance for ambiguity is relatively high, that emotions and aggression should not be shown and that there is less perceived need for regulations. (Hofstede & Hofstede, 2005, p.167ff)

Because in this case the cultures are similar, this dimension should not affect usability work by making it more difficult in China compared to usability work in the USA or Scandinavia. However, it is possible that uncertainty avoiding people might be less willing to adapt to new ways of thinking and working, which could make it more difficult to introduce user-centered methods. Countries scoring low on the UAI scale, on the other hand, could be expected to be more open to new ideas and methods.

### 4.3.1.5 Long-Term Orientation (LTO)

The highest-ranking factor for China is LTO. This is very different from the USA and the Scandinavian countries, which rank rather low. Asian countries also generally score high on the LTO dimension, while most Western countries have relatively low LTO scores (Hofstede, n.d.).

Long-term-oriented societies value for example respect for learning and hard work. In short-term-oriented societies such things as individual rights, freedom of expression and thinking for oneself are seen as important values. (Hofstede & Hofstede, 2005, p.217f) These differences can be related to the individualism dimension and what has been mentioned earlier about respect for authorities and thinking for oneself instead of following orders. Short-term-oriented societies such as Scandinavia and the USA value thinking for oneself higher and emphasize the individual more, compared to China. How this potentially could affect usability work has already been discussed.

According to Fang and Rau (2003), "Chinese people tend to attribute both their successes and failures to internal causes rather than external causes. The Chinese are taught that the route to success is hard working. They first introspect about whether they have tried hard enough or whether they have correct attitudes when facing consequence of an event." (Fang & Rau, 2003). This reflects the LTO values. It also implies that Chinese users might be more inclined to believe that it is their own fault if they have problems using a system. Users taking part in usability testing are sometimes afraid of seeming stupid by criticizing a system, especially saying that they do not understand or have problems using it (Preece et al, 1994, p.629). This can be a problem in other cultures as well, but perhaps more so in China where it is perceived as a loss of face. Schaffer (2004) claims that one of the problems with usability testing in Asian cultures is that within these cultures it is seen as embarrassing to admit having

problems with finding something. This could make Chinese users less likely to point out usability problems.

# 5 Software development and management

*In order to discuss user-centered design and usability work, it is necessary to discuss some features of product development. Companies have different capabilities to carry out development work, and different methodologies for reaching their business goals. The level of these capabilities can be seen as the company's maturity to deliver software products of high quality.*

## 5.1 Software development methodology

The goal of almost all software development companies is to make profits. Profits are usually measured in money, but can also include other measurements, such as investment in good business relationships (Norin & Wimelius, 2005). Management is the foundation of an organization, and in order to make profits the organization needs to invest in good management skills. Besides management the most important key to success is the methodology used by the organization. A good methodology increases not only the probability to develop high quality products, but also the reliability of the organization's ability to deliver expected results. (lecture, Guo, 2006-03-01)

By methodology we refer to the processes that are used in software development. A process can be described as a structured set of activities that are performed to reach a specific goal, which is to accomplish a specified result within some given time frame. (Gulliksen & Göransson, 2002, p.136) Different organizations use different methodologies. These can be either commercially developed processes such as RUP[31], or a process developed to be used only internally within a certain organization. (Göransson, 2001) Organizations usually aim to create a methodology which can be used in all of the organization's development projects, also in different countries. This helps the organization to maintain the same type of work methods and is intended to guarantee the same product quality independent of the location. (lecture, Guo, 2006-03-23)

### 5.1.1 Software development processes

Many organizations' development processes are based on the Waterfall model. The Waterfall model describes a sequential development of software, where the development is done in phases that usually consist of analysis, design, coding and testing. The model is sometimes criticized for the fact that the phases do not overlap, meaning that the next phase is started only when the previous phase is completed. However, the model includes loops back to previous phases, although normally only to the closest previous phase. The model also states that the requirement phase should be completed when the design phase starts, meaning that all the requirements should be identified early in the development work. (Gulliksen & Göransson, 2002, p.139ff) This is rarely possible in reality since requirements tend to change

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[31] The Rational Unified Process, or RUP, was developed by IBM Rational Software and can be described as today's de facto standard process in the software industry. It is intended to be a process for implementing object oriented development methods, but is also used for modeling business processes. (Prince, 2005)

during the project lifecycle[32]. (lecture, Guo, 2006-04-26) Other drawbacks with the Waterfall model are that users are usually excluded from the development work (Gulliksen & Göransson, 2002, p.141) and that testing normally is done only in the end of the project, when the problems identified tend to be more complex and expensive to resolve (Kruchten, 2001).

Most organizations seem to have noticed that iterative development is more beneficial than the traditional Waterfall model. Many organizations also claim that their development processes are iterative, but in reality this usually only means that some iteration with users takes place in the beginning of the development work to capture the requirements. After this the teams usually continue the work so that it mostly resembles the Waterfall model. (Göransson, 2001)

## 5.2 People involved in development processes

Depending on the project and the company culture, the people involved in the development process vary. A typical setup is to include a project manager, software engineers, hardware engineers, system engineers, quality engineers, test engineers and participants from marketing, financial, and legal departments. The project manager usually functions as a direct link between the organization and the customers, as well as between different departments and teams within the organization. (Gray & Larson, 2003, p.7)

### 5.2.1 The users' advocate

We have argued that in order to create usable systems, it is important that issues concerning usability are taken into consideration. In order to improve the organization's awareness of usability, a usability expert should be included in all the development teams. The usability expert's role is to act as the users' advocate. A usability expert can operate under many different names, such as HCI expert, usability engineer, interaction designer, user experience architect, or cognitive scientist. No matter what formal title the usability expert has, he/she should have an interdisciplinary knowledge basis. This is because some knowledge about not only technology, but also cognitive psychology, sociology, design and economics, among other, is needed. It is also important that the usability professional is involved in the whole process, and not just during the requirements gathering or testing phases. The need for a person who is responsible for usability matters is motivated by experiences showing that although many approaches claim that usability should be everyone's responsibility, and everyone in an organization should focus on usability issues, in practice a shared responsibility tends to become nobody's responsibility. (Boivie et al, 2006)

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[32] When developing software the actual development is usually done in the form of a project. A project is defined as "a complex, nonroutine, one-time effort limited by time, budget, resources, and performance specifications designed to meet customers' needs" (Grey & Larson, 2003, p.5). The project lifecycle is defined in ISO 18529 as "the stages and activities spanning the life of the system from the definition of its requirements to the termination of its use, covering the conception, development, operation, maintenance support and disposal". (Gulliksen & Göransson, 2002, p.103)

## 5.3 Organizational culture

Organizational culture is one of the most important things that affect the success of a project, together with the management system and the methodology used for development. (Gray & Larson, 2003, p.73) It can be defined as the 'personality' of the organization, and consists of a system of shared values, norms, assumptions and ideas about how things work and should be done. (Kaufmann & Kaufmann, 1998, p.366) For example, it helps the organization to clarify the relationships within the organization and defines the standards of behavior, such as dress code, working hours, and the structure of authority. (Gray & Larson, 2003, p.74)

There are many aspects that affect the organizational culture, the surrounding culture being one of them. (Hofstede & Hofstede, 2005, p.20) Multinational companies are influenced by both the home and the host culture. The nationalities, and also personalities, of the organization's founder and later top leaders to a large extent shape the basic values of the organization. When multinational companies in other countries meet value patterns that differ from those of the home culture, the company culture and working methodology serve as a way of keeping the organization together. The home culture of the organization also normally functions as a frame of reference. However, even in those cases when foreign subsidiaries formally adopt the organization's home culture, they are likely to internally continue functioning according to the values of the surrounding host culture. (Hofstede & Hofstede, 2005, p.341f) Understanding organizational cultures and how organizations work therefore requires studying the surrounding societies and their national cultures.

### 5.3.1 Some features of Chinese organizations

According to Professor Wah (2003), the Chinese culture and social forms strongly affect the way organizations in China are managed. An example is that in Chinese organizations, relations between superiors and subordinates are based on hierarchy, and power within the organizations is highly centralized. (Wah, 2003, p.10) Senior managers are generally more respected than the junior ones, and the role of the senior managers is not primarily to perform work tasks at the computer, but rather they should act as role models, receive their subordinates and give the impression of being an important person with power. (interview, Guo, 2006-04-05) The hierarchical structure of Chinese organizations is based on the influence from Confucianism and its view on unequal relationships, where the subordinates, such as younger persons, should obey the superiors, such as older persons.

Distinguishing features of Chinese organizations are the lack of written policies and rules and a loose structure. (Wah, 2003, p.10) The processes are generally poorly defined and followed, which often results in bad quality, longer development cycles and exceeded budgets. (lecture, Guo, 2006-04-26) In general, Chinese managers focus more on the quantity of products to be manufactured than on the quality of those products. Contrary to conventional wisdom, Chinese business people do a minimum of product tailoring and a minimum of local design, in order to keep the business deals less complex. (Jagersma & van Gorp, 2003)

As we have discussed earlier, China is a collectivist society where loyalty and responsibility for other members of the group is paramount (Wah, 2003, p.10f). Another distinguishing feature is that, as a kind of self protection, Chinese employees tend to tell their superiors what

the superiors want to hear. (Chee & West, 2004, p.126) In collectivist societies, relationships come before the tasks (Hofstede & Hofstede, 2005, p.217f), and building trust before doing business is vital. (Hofstede & Hofstede, 2005, p.102f) As a result the business deals always start by making friends with each other, for example by treating customers with banquettes, presents and other arrangements. (lecture, Guo, 2006-04-26)

### 5.3.1.1 Guanxi

Networking is highly significant in order to gain business success in China. Relationships are emphasized, and the very central concept of guanxi is acknowledged even outside the Chinese business world. (Hofstede & Hofstede, 2005, p.217f) Guanxi refers to a particular kind of networking which is based on reciprocity and trust. It is often translated as 'connections' or 'relationships', but neither of the terms reflects the wide cultural implications that the concept of guanxi really describes. Guanxi describes a personal connection between two people in which personal favors or services are performed, or a state of general understanding between two people to be aware of each other's needs and take them into consideration when deciding future actions which may or may not consider the other person. (Wikipedia, 2006d) The concept of guanxi makes face-to-face contact more important than in most other cultures. It can also contribute to long lasting business relationships, where the customers have a 'moral obligation' to continue the business arrangement, only in order to save both parties' faces. (Efendioglu & Yip, 2004) The concept of guanxi is thus related to the Confucian values of face and social harmony. (Chee & West, 2004, p.61f)

## 5.4 Development process maturity

Even though no ideal process exists that would suit all organizations, there is room for process improvement in many of today's development organizations, since few organizations possess the 'perfect process' and many even rely on ad hoc[33] processes. (Sommerville, 2001, p.43) This is probably especially true about new organizations. According to Paulk et al (1993) all organizations are initially immature concerning their software development processes. The distinguishing characteristics of an immature organization are lack of specified processes and management. Such organizations focus on immediate crises, and their budgets and schedules are routinely exceeded. Functionality and quality are often traded off to meet the tight deadlines. The quality of the products is difficult to predict and activities such as testing are often eliminated due to lack of time and money. (Paulk et al, 1993)

In contrast, mature organizations possess the ability to manage the software development process. Work activities are performed according to the planned process, and customer satisfaction and quality is monitored by managers. These organizations develop realistic schedules and budgets which are based on earlier performance, and as a result they usually achieve their planned results for schedules, cost, functionality and product quality. The company culture strongly supports the disciplined process since all of the participants understand the value of working according to the process. (Paulk et al, 1993)

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[33] An ad hoc process refers to an improvised event or solution, as opposed to well-prepared ones. (Wikipedia, 2006a)

## 5.4.1 The Capability Maturity Model (CMM)

Especially in the last few years, the software industry has shown a great interest in process improvement. The reason is that it is assumed that improving the process will lead to improved software quality. (Sommerville, 2001, p.558) As a help for organizations that want to improve their processes, different methods have been developed. One of those is the Capability Maturity Model (CMM), which is a process maturity framework developed by the Software Engineering Institute (SEI) at Carnegie Mellow University. CMM consists of key practices that guide organizations toward improving their software development and maintenance capability. The idea is that continuous process improvement should be achieved in evolutionary steps, where process maturity increases in stages that build on one another. The CMM framework organizes these stages into five maturity levels[34], shown in figure 6, which can be used to evaluate an organization's software processes' maturity. By determining the maturity of currently used processes, the organization can more easily prioritize and direct its improvement efforts. (Paulk et al, 1993)
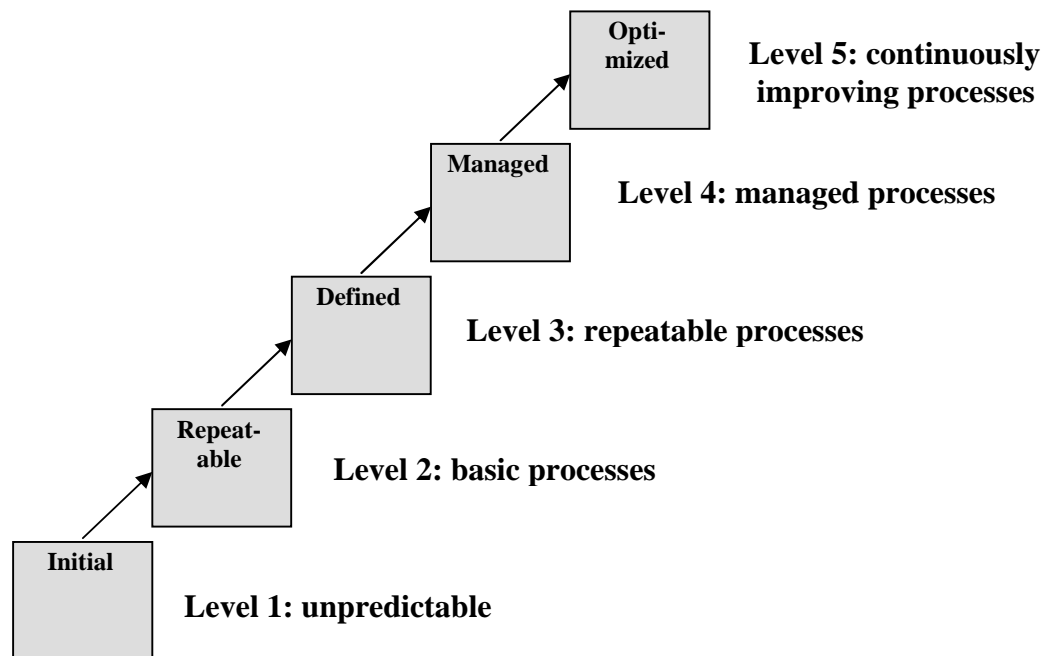


*Figure 6 - The five levels of software process maturity. Source: Paulk et al (1993).*

CMM and various international standards are popular and respected in today's Chinese IT industry. (Liu et al, 2002) However, most Chinese software organizations are still on CMM levels 1 or 2, according to Professor Mingsen Guo, while many Western companies already have reached levels 4 or 5. (lecture, Guo, 2006-04-26) This indicates that most of the Chinese organizations' processes still are unpredictable, or that they only have established some basic project management processes in order to control cost, schedule, and functionality.

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[34] The levels are described in appendix A.

It is considered highly beneficial for an organization, for example a development company trying to get contracts from American and European enterprises, to be able to show a high CMM ranking. At the same time the costs for improving processes are high. According to Koch (2004), the result is that some organizations exaggerate or lie about their CMM levels. Another problem is that when organizations are assessed only a subset of the organization's projects, normally between ten and thirty percent, are investigated. Claims that this assessment is valid for the whole organization are probably misleading, especially for larger multinational companies[35]. Also, there are very few follow ups to check that the required process attributes continue to be implemented within the organization, and therefore a CMM level does not guarantee that the organization actually works according to the framework. (Koch, 2004) Another drawback is that the CMM framework does not consider the whole product development, but only software development. Therefore the CMM framework has been further developed to CMMI, where 'I' stands for Integrated. (lecture, Guo, 2006-04-26)

### 5.4.1.1 CMM and usability

Since organizations benefit from improving their work processes, usability issues could also be taken into account with frameworks such as CMM. (Sulaiman, 1996) According to Jokela and Lalli (2003), CMM (and later CMMI) does not directly impose any requirements for usability. The fact that an organization has reached CMM level 5 does not, in itself, mean that usability is a priority or that its products are usable. These frameworks do, however, leave space for usability practitioners to influence the development process so that usability can be considered an important quality factor. (Jokela & Lalli, 2003)

## 5.5 The Usability Maturity Model (UMM)

To integrate user-centered methods into an organization's development process, the current state of the organization's usability process and overall attitude toward usability matters need to be examined. The result of this assessment can be used to decide how user-centered activities should be introduced. (Liu et al, 2002) (Jokela et al, 2006) There are several methods for determining an organization's current state of usability processes. Many of them are derived from CMM or similar models. However, these methods are *not* intended to be solutions to how CMM could take usability into consideration, but they follow the CMM trend by assessing the maturity of usability practices. (Jokela et al, 2006)

The maturity model we use is UMM-Human Centeredness Scale, which derives principles from CMM as well as from other models such as ISO 13407 (Earthy, 1998). Similar to CMM, the UMM-HCS consists of five levels[36], where each level is built up by one or more process attributes which in turn include several management practices. (Liu et al, 2002) The levels run from A to E, where level A in similarity to the CMM level 1 describes the lowest level of maturity. Companies on level A have identified the basic need of improving development work and the focus on usability, and some information about the users is collected; however, the user-centered design work is still practically non-existent. Organizations on the highest

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[35] Organizations therefore sometimes choose not to claim that the whole company has reached a certain level, but that they are for instance CMM level 4 - certified in a certain development center or product group. (Koch, 2004)

[36] A description of the five levels is included in appendix B.

level of usability maturity, on the other hand, manage user-centered work in all their projects, have a systematic approach and high acceptance of the expert skills of HCI practitioners, as well as a human-centeredness attitude toward its own processes and systems. (Earthy, 1998)

The HCS is intended to be used for assessing the level of human-centeredness of an organization with regard to its system development activities. The majority of the attributes that are used concern management practices, but the scale also measures for example staff and management attitudes to human-centeredness and the technical capabilities. The scale of human-centeredness of an organization also provides information about how to best improve the human-centered approaches in that organization. An organization on a certain UMM-HCS level will be able to understand the benefits of the next level, and will also be able to see how to improve the existing methods to gain the next level of maturity. (Earthy, 1998)

## 5.6 Obstacles to UCD

In the Western countries today, many organizations claim to be interested in applying user-centered methods. However, there are also factors that hinder usability work. Some of these are directly related to the organization's attitudes, skills and work practices. While some organizations may agree with the ideas in theory, they may not be ready to change their existing methods to make the methods more user-centered. Others may lack the necessary usability expertise within the organization. (Gulliksen et al, 2003) Usability work is also made more difficult because many of the processes used today do not contain enough support for usability. (Gulliksen et al, 2004) In many cases, usability is seen as only concerned with interface design and it is therefore not integrated in all phases of the development process. (Boivie, 2005)

Another important factor is resource constraints. (Gulliksen et al, 2003) Software development is often about trade-offs, and usability is seen only as one of many important aspects. (Boivie et al, 2003) Priorities vary from project to project and from company to company. The trade-offs that an organization has to make concern time, money, and quality, and in many cases time to market is perceived to be critical. Many companies therefore choose to develop a product for the market in as short a time as possible, and then make improvements in requirements for later versions. (Gray & Larson, 2003, p.104f)

Another problem for the development of usable systems is that often the company only delivers what has been agreed on with the customer organization. Knowing the customer's budget, the company needs to make trade-offs. Taking a user-centered approach may require more time and resources spent on the project, and many times the customer is not willing to pay for it. (Norin & Wimelius, 2005) Usability is also often taken for granted by the customer organization. The customer often assumes that a usable system will be developed, but in many cases usability has to be explicitly asked for and included in the requirements specification in order to be addressed. (Gulliksen & Göransson, 2002, p.55f)

## 5.7 Improving usability maturity

Changing work methods to a more user-centered way of developing systems can be difficult, and normally has to be done in small steps where existing work methods are extended with

user-centered activities. (Gulliksen & Göransson, 2002, p.154) Earthy (1998) describes how moving up from one UMM-HCS level to another can be viewed as a major cultural change. While the organization is still on level A, the lowest level, the attitude of people in the development team toward users is often hostile; the problem is thought to be the users and not the system. In organizations on the next level, B, the attitudes have changed. The teams at this level realize that the system is not developed for its own sake, but to serve the users. Moving up to level C means that development teams now consciously focus on users' needs and capabilities. They are aware of the fact that the end-users are not the same people as the buyers or analysts, developers or testers, and that the needs and skills of end users are different from those of the specialists. At level D, the organization uses user-centered processes, where usability expertise and methods are seen as normal parts of the development. The final level, E, means that the focus has shifted away from functionality of software or hardware, to what the goals of the customer organization are and how the system could help the customer achieve these goals. (Earthy, 1998) Every step between levels requires the organization and its employees to change in several ways, and is likely to take time to achieve.

In order for organizations to be able to make such changes and to work more user-centered, it is important that there is management support for user-centered methods. (Gulliksen et al, 2004) The organization has to decide that user-centered methods should be applied. Strategic decisions regarding the organization's activities and priorities are made by the top management, and therefore it is also important that someone in the top management of the organization has some knowledge of usability. (Gulliksen & Göransson, 2002, p.27) The importance of management support and attitudes implies that for an organization to change and start working more user-centered, the organization itself must want to make these changes and understand the importance of usability methods. (Sandblad et al, 2003) To improve the usability work in organizations, managers need to be aware of their role as supporters of usability work, explicit support for user-centered principles should be increased, and HCI knowledge among stakeholders involved in the development should be improved. (Gulliksen et al, 2004)

### 5.7.1 How to establish usability work…

For someone to introduce user-centered methods in an organization, it is necessary to understand what could motivate the organization to change its methods and priorities. According to Mayhew (1999), the process of establishing usability work in an organization consists of three phases: promotion, implementation and institutionalization.

Promotion is the first step, which consists of influencing people within the organization and making them aware of the benefits of user-centered methods. It is then important to identify what hinders usability work and how these factors could be addressed. Motivators for change must also be identified and exploited. These motivators could be for example if a product fails in the market and it is clear that one reason for this is poor usability. Another motivator could be perceived market demand for improved usability. Mayhew claims that there has to be at least one such motivator present in order for change to take place. In this phase, usability costs also have to be justified. A way to do this is to try to demonstrate the value of some selected usability techniques. (Mayhew, 1999)

If promotion is successful, some kind of usability department or team is established. In this second phase, the focus is on influencing projects. Managerial issues therefore become more important. It is also crucial to win continued support for usability work. According to Mayhew it is best to introduce usability techniques one at a time, for example starting with usability testing in order to demonstrate the benefits of usability techniques and gain more support for them. Mayhew also means that it is usually a good idea to start by focusing on some projects and later expand to other parts of the organization. (Mayhew, 1999)

The last phase means to develop the usability work into being a standard part of the development work done in the organization. Therefore the focus is on influencing the development processes used, and to integrate usability methods with the process used in the organization. (Mayhew, 1999)

## 5.7.2 ... depends on the company culture

In the previous sections, we have discussed introducing usability methods in organizations. There is, however, no 'one-size-fits-all' solution to this, but how to begin and which methods to introduce first depend on the company culture. Iivari (2005) proposes different approaches to usability work, according to the internal culture of an organization. In organizations that encourage their employees to participate in decision-making, methods that emphasize informal information sharing, training, teamwork and employee ownership should be chosen. For organizations based on a hierarchical structure, usability work methods that emphasize rules, standard procedures, documentation and control are better suited. Organizations that are distinguished by an innovative and experimental character should choose methods that emphasize creativity, new ideas and freedom to take risks. Methods that rely on teamwork, brainstorming and iteration are suitable. The organizational culture that emphasizes rational thinking and fast, measurable improvements should select methods that emphasize cost-benefit analyses that show how the business benefits from including usability work. (Iivari, 2005)

# 6 Interview results

*In this chapter we present our interview results. We begin with giving an introduction to the software companies, present the results from these interviews, and then include the interview results from the usability experts we have been in contact with. All the interviews are based on the interview guides that can be found in the appendix.*

## 6.1 Companies

In the following sections we present each company at a time. We give a brief introduction to the type of products they are developing, describe customers, development teams, and the company culture, and present the development methods and the usability work in these organizations.

### 6.1.1 Company 1

The interview with Mr. Zhao, a product manager, took place at a café at a university in Shanghai. As most of the other interviewees, he has a technical background, but has not been involved in actual development work for two years.

#### 6.1.1.1 The company

The company is one of the largest Chinese software development companies, founded in the beginning of the 1990s. It belongs to an International Group, which also includes a company which targets the market of the rest of the Asia-Pacific region and a company which specializes in middleware[37]. This company focuses on research and development (R&D) and, geographically, on mainland China. The company headquarters are based in a city in southern China, and it has several other branches around the country. Each of these is responsible for one or more products. Although most of the research and development is done at the headquarters, each branch in mainland China is responsible for its own product development. Company 1 is CMM-4 certified since April 2005.

The organizational structure is described by the interviewee as quite flat, since each of the offices around China does its own product design and handles its own customer contacts. The company culture is described as very Chinese, and all of the employees are of Chinese origin, including a few from Hong Kong. In the few cases that there have been foreigners involved in the development, it has been as consultants.

#### 6.1.1.2 Products

The company develops web based enterprise management software and e-business application solutions. It also provides software-related management consultation and technical support services. The product that the Shanghai office is responsible for is a Human-Resource management system. Although the Shanghai office is primarily a sales department that handles marketing and customer relations, it also does some customization of standard

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[37] Middleware can be described as software that connects software applications and makes it possible for them to exchange data. It is an additional layer of software between the operating system and software applications, often used to support distributed applications. (Wikipedia, 2006g)

solutions which are developed by the headquarters' R&D department.

### 6.1.1.3 Customers

The customers are other companies and organizations in mainland China, including both private companies and governmental organizations. All of the customers of the Shanghai branch are based in China, and the only 'international' customer is a Chinese branch of an international hamburger chain.

### 6.1.1.4 Development process

The company works according to a waterfall model including the phases demand investigation and analysis, system design, system coding and system test.

According to the interviewee, product development always starts with a product manager's idea. High level requirements initially come from the product manager, who based on market analyses decides which products to develop. Thus, the information is not based on what the customers specifically ask for, but merely the perceived market needs. Within the company there is also a product requirements and analysis team which includes product specialists who participate in defining the requirements. These specialists' job is to know that type of products the customers ask for and what customers need from these products. Except for the market analysis no information about customers is gathered, and no end users are involved in the requirements phase. Requirements are described as being defined in analyses, rather than gathered.

The market analysis is used for creating a priority list of high level requirements. After the first requirements are defined, a prototype is developed. It is used to define the more detailed requirements; however, it is only discussed within the company. The analysis of the prototype is based on their own experts' and external consultants' evaluations and it is not tested on the actual end users or customers.

After the coding, there will be testing. First the code is tested for bugs, and then the product is tested by the product manager and other employees in the company. After the product manager has approved it, the product is demonstrated to representatives from the customer organization. In the end of the development process there may be some user testing, but normally not with the end users but with a representative from the customer. This person is usually the buyer of the system, and, according to the interviewee, has enough knowledge about the end users' needs.

Once the product is released, feedback from the customers helps the company to improve later versions. This feedback is usually collected by their support department. The customers usually call the support and tell what kind of problems they are facing with the product, and the support department acts both as help for the customers and as a way of collecting feedback from them. According to the interviewee, the first version of a product usually has many faults and drawbacks, but later versions are improved based on the information from the support department.

### 6.1.1.5 Teams and people

The company has different teams which are involved in the development of a product. These teams include the above mentioned product requirement and analysis team, which is led by the product manager, and a research and development team which is responsible for coding and for testing code. There is also a quality control team which is responsible for some testing, for example beta testing[38]. People involved in development process are system analysts, team leaders, software engineers, database and system administrators, quality assurance engineers and technical writers.

Design of the interface of the system is handled by the company's human factors team, and is done separately from the other development tasks. The human factors team does not work together with the product requirement and analysis team to define the requirements, but is of course supposed to understand the requirements and design the interface according to them. People working in the human factors team are computer engineers, designers, and other people with an eye for beauty.

Communication between the different teams is done via the product manager. It is also the product manager who handles the contacts with the customers. So in that way, the product manager acts as a bridge between the customer and the development team, as well as between the different teams involved in the development.

### 6.1.1.6 UCD

The interviewee claims that the company is aware of the concepts of 'usability' and 'user-centered design' and would like to work more user-centered, but that in practice it cannot work according to these matters. The reason given is lack of resources and money. According to the interviewee the time is also very limited, as their product needs to hit the markets before anyone else's does. Mr. Zhao argues that because the Chinese market changes so quickly, they simply do not have time to do more testing or in other way involve users more. The most important factor is considered to be time to market, not to develop the best product. Because the company has a reputation to be the largest and best in mainland China, that is also believed to guarantee many customers in the future.

Another reason for not working more user-centered is that, according to Mr. Zhao, the customer organizations are not interested in user-centered development work, but only some standard solutions. In his opinion, their Chinese customers would probably not wish to have more user-centered development, since it would only take a lot of their time and cost more money.

## 6.1.2 Company 2

The person we interviewed, Mr. Huang, is a system developer with a technical background. The interview took place at the company's Shanghai office.

### 6.1.2.1 The company

Company 2 is a large, CMM-5 certified American software development company. Except for

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[38] Beta testing is testing that is done at the end of the development, just before the release.

the office in Shanghai, it has branches in a couple of other large cities in China. The company culture is considered to be young and dynamic with some influences from the land of origin. Communication is considered good, and a lot of feedback is given. The employees have monthly one-to-one discussions with their superiors. They also have so called skip-one-level discussions where the employees get to talk to their manager's manager. Each employee also has a mentor within the same company.

The power within the company is described as quite decentralized with a lot of research and development venues in mainland China and other parts of the world. The company culture is experienced as consisting of a diversity of representatives from different parts of the world. In the Shanghai office there are employees from different parts of China, India, England, the USA and the Netherlands. The language used is mainly Chinese, but for e-mails and other communication English is commonly used. Managers in the Shanghai office are all locals since they have the best knowledge of the local markets.

### 6.1.2.2 Products

Examples of products include search engines and an e-mail portal. The product developed in Shanghai is a global product for the Internet. It is custom made in Shanghai to serve the Chinese users. This site is the only place where customization for the Chinese users is done. There is also some development for the global market.

### 6.1.2.3 Customers

Potential customers include all Internet users. Among the users a large part consists of students and business people.

### 6.1.2.4 Development process

The product life cycle follows the organization's own process. It is based on a number of phases where each new phase is started after the current phase is tested for 'zero bug bounce'. The phases included are planning, design, implementation, stabilization, and release. When the requirements change, the development team usually returns to the previous phases of development.

During the development, different prototypes are being made. Depending on the developer, the prototypes are either paper sketches or computerized. These are, however, used only internally so that the team can understand the mind flow of the developer, and thus not used for testing the design with users.

### 6.1.2.5 Teams and people

People involved in the above mentioned phases have different backgrounds, and different people are involved in different phases. Among other, developers and usability specialists are included.

Company 2 has a special team of interaction designers who collect information about the users. Some of this information is collected via the company's blogs where users can give feedback about the services and functions. The team is also responsible for conducting

usability tests with different user groups such as students and business organizations. Only the interaction designers meet the users. Team members have diverse backgrounds, mostly in psychology, design, color and form.

The person responsible for the user feedback is the program manager. He/she is the link between developers and usability specialists, and the communication between these teams is done only through the program manager. According to the interviewee, the person who works as a program manager needs to be a "good communicator", since the different teams speak "different languages". The program manager is also responsible for the communication between the development team and other departments.

### 6.1.2.6 UCD

According to Mr. Huang the organization acknowledges the terms such 'usability' and 'user-centered design' and all teams work toward these goals. However, the different teams do not communicate directly with each other but instead concentrate on their own tasks. It is then the program manager's job to collect all the ideas concerning new products and new versions into requirements. Understanding the customers' needs is also considered the program manager's responsibility.

One reason for the company to continuously improve their products, according to the interviewee, is that customers are not loyal. If the company does not continuously develop better products, the customers will choose one of their competitors' instead.

## 6.1.3 Company 3

We interviewed Mr. Yang, a software engineer, in a tea house in Shanghai. Mr. Yang has a technical background and has been working for the company for two years. His role in the team is as a software designer, developer and tester.

### 6.1.3.1 The company

The company is a large, CMM-5 certified global organization with the USA as the land of origin. Its headquarters are in the USA and it operates in more than 170 countries around the world. In China the organization has four development departments which all focus on different markets. The department where Mr. Yang works focuses on development for Japanese customers. The department in Shanghai employs 60 people, all of them Chinese. Mr. Yang experiences the company culture as Chinese with "localized values", and explains that the department has only local managers and that they "do business like a Chinese company".

### 6.1.3.2 Products

Products developed by the company include for example digital cameras, printers and computers. The product that Mr. Yang works on is a web based application for managing printers in networks within the organization. It is a standard product originally developed in the USA, but the department in Shanghai does some customization.

### 6.1.3.3 Customers

The customers are other departments within the same organization. So far, the product is only

used by the organization's departments in Japan and therefore not under sale now. There are plans to start selling it to other companies in Japan and later on to other markets besides Japan. The product is planned to be launched in China as well. So far the plan is to use the same interface as in Japan, and only the language will be localized, due to the fact that the Chinese users are considered to be much like the Japanese.

### 6.1.3.4 Development process

The organization has its own development process which resembles that of the waterfall model. This process is used in the development departments in mainland China and in India where they have a large development center. The process starts with requirements analysis, followed by design, coding and testing. Different kinds of tests are used, including unit test, system test, performance test and acceptance test. There is relatively little feedback and returns to previous phases. According to the interviewee, there are no tests with end users.

During the development, some of the employees travel to Japan and stay on site during the whole process. They communicate with the customers in Japan and send back information to the developers in China. According to Mr. Yang, they also participate in requirements gathering. However, since Mr. Yang himself have not been to Japan, he did not know more details about the actual work done on site or how requirements gathering is done.

### 6.1.3.5 Teams and people

In the development team some people with 'Japanese background', meaning that they have worked in Japan, are included. People involved in the development team have backgrounds in business economics, management and computer science. Each team consists of a project manager, software engineers, designers and testers. There are also quality and software configuration managers who are described as being "company based, not part of the team".

### 6.1.3.6 UCD

Mr. Yang is not familiar with UCD or usability.

## 6.1.4 Company 4

The interview was done with the CEO of the company, Mr. Chen, at the company's office. There was also a product developer present, although he did not participate in the interview.

### 6.1.4.1 The company

The company is a small Shanghai-based company with 30 employees. It is not yet CMM certified. The plan is to gain ISO 9000 certificate, since this is important for the company and management, according to the interviewee. The company has three departments: development, marketing and sales. So far the company is represented only in Shanghai, but is planning on establishing in Hong Kong, Beijing and some other major cities in mainland China. All of the employees are Chinese. The working environment is described as young and creative.

### 6.1.4.2 Products

The company's product is a device used for mobile communication. They have developed a

service that sends the customers information by request. Sensors have been installed in some strategic places in Shanghai, and customers can use these to request information about for example restaurants nearby. The requested information is then sent to the customer's mobile phone via SMS.

Research for the product development started in 2004, and the product has been in use since the beginning of 2006. The next development is going to be an English version of the product, as well as some technical adjustments.

### 6.1.4.3 Customers

Potential customers include everyone living in Shanghai, but the typical customers are young people who want to get information about the services in town. Users do not pay for the service, but have to register as customers on the company's web page.

### 6.1.4.4 Development process

According to the interviewee, the company does not use a specific process model, but the CEO desires to improve their processes. The product development process includes a requirement phase, development, design and test. For gathering requirements the company uses an external market analysis company, but they have also done some own requirements analysis. The company has a group of 100 potential users, mainly friends of the employees, which are involved in requirements analysis and testing. Tests are conducted with some people from this group and from the company. These tests measure mainly the functionality of the service.

The company has also collected some feedback from the customers who have been using the service. Feedback is gathered by the marketing team, and it is used to help the developers improve the functionality of the product. Comments from the users usually concern the information they need and not the user interface. Based on this feedback the company plans to make some changes to the product. For example, the next version of the product is planned to be simpler to use and at the same time more technologically challenging.

### 6.1.4.5 Teams and people

There is no special usability expert in the company, but Mr. Chen claims that everyone involved in the development process tries to work very user-centered. He emphasized that everyone in the team must be aware of the importance of usability, and said that these issues are often discussed within the company. However, only some of the developers meet real or potential users.

### 6.1.4.6 UCD

The CEO is familiar with usability issues. As an example, he mentioned that he has been introduced to some articles concerning the psychological needs of humans. Important issues to consider are, according to the interviewee, the time the user needs to spend on using their product and the amount of button clicks before the information is received by the user.

### 6.1.5 Company 5

Two interviews were conducted with this company. The first interview was performed at a café, where we met Mr. Wu, a software engineer whose main responsibilities in the team concern the development of user interfaces and graphics. We later met a Senior Human Factors Engineer (HFE), Mr. Zhu. Mr. Zhu has a PhD degree in psychology. He has been working at Company 5 for about four months and before that he worked for a Scandinavian company. This interview took place at the company's R&D department, and mainly concerned the usability work done within the company.

#### 6.1.5.1 The company

Company 5 is a large American company with branches in several different parts of China. In Shanghai it has a factory and a new R&D department which was opened in the beginning of 2006. The R&D department has about 2000 employees. Mr. Wu mentioned that the company is about to invest into a usability center in Shanghai. That department is to serve the whole China. At the moment they only have two persons working at his department, the human factors engineering (HFE) department at the R&D center. [39]

The company structure is described by Mr. Wu as "top-down" and they use a system for power sharing, which means that two persons are in charge; this is used in order to decrease risk and share responsibility. A problem with this, according to Mr. Wu, is that it takes too long to make decisions. Compared to Chinese companies, he thinks that the hierarchy is very different. An example of this is that they can talk to managers at any level if they need to discuss something, whereas in typical Chinese companies one is only supposed to discuss with his/her own manager. He experiences the communication to be open and "skip levels". The company culture is perceived to be more Western than Chinese, and managers are from many different countries, not only China but also the USA or other western countries.

Mr. Zhu compared his experiences of working in a company with Scandinavian origins with working in Company 5 with a more American culture. In his opinion companies from the USA are more practical. This means that sometimes management claim that usability is important and they recruit people to work with these issues, but if business is bad they cut down on this research. He claims that the attitude is one of "it is nice to have, but not necessary". In comparison, European companies' view on usability is less dependent on if the company is doing well or not.

#### 6.1.5.2 Products

Company 5 develops many different products, including for example networking and communication products, and computers.

The department where Mr. Wu works is part of the company's IT department, and they function as internal consultants for the whole company. They develop different kinds of software solutions for the rest of the company, and "offer services rather than products". Examples of systems that they have developed include a payroll system for the company's

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[39]  We could not get any information concerning CMM certification of the company's sites in China. In 2005, the company's only CMM certified sites were located in India, and had reached the CMM level 3 or higher.

HR department and a tool for translating their website from English to other languages.

Mr. Zhu's main work tasks are user research and usability testing for internal customers. So far he has mostly done heuristic evaluations[40] for customers' websites.

### 6.1.5.3 Customers

Customers to both departments are other departments within the same company. The customers of the department where Mr. Wu works are not only departments in China but also in the USA and Europe. All their products are customized for those departments.

The HFE department also has international customers, mainly in the USA and India. There is a HFE team in the USA and they work together in order to provide solutions to international customers.

### 6.1.5.4 Development process

The development work within the company was described in the interview with Mr. Wu, who explained that the company works according to the waterfall model. In his opinion, the main problem with the waterfall model is gathering requirements, which is felt to be very difficult. One problem he mentioned is that customers have difficulties describing exactly what they want and therefore the development team could easily influence them. Therefore, in the beginning of the development process only high-level requirements are defined.

At the beginning of any project they have meetings with the stakeholders to define these requirements. Usually, one or two persons from the customers participate in the requirements phase. The meetings are normally held face-to-face. During these meetings the customers briefly describe the background, so that the development team understands what the customers need. After that the team does some background research and returns to the customers with a proposal. The proposal usually includes things such as a plan for the development work, cost estimation and a time limit. A prototype is developed after the proposal, and they get feedback on this to find more requirements. The prototype is changed according to feedback, and when it is good enough it is "formalized" and they have a product.

Requirements are sometimes also gathered from people outside the company. An example is if they develop a system that will be used by marketing and they want to know how people outside the company react to it.

Testing is usually done when the development phase is almost at end and the product already has all the characteristics. Customers are involved in the acceptance test, which means that the product is demonstrated and the customers use it for trying different tasks. However, at this phase it is difficult to change the requirements or make anything but minor changes to the product. People who are involved in testing the product are selected among internal workers, since the product is only for internal use. Bigger programs are sometimes tested in India where they have a large test center.

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[40] Heuristc evaluation belongs to the evaluation methods that do not involve users. Instead, expert evaluators examine the system and try to find usability problems. When looking for usability problems, they are guided by certain usability principles, the so-called heuristics. (Preece et al, 1994, p.676f)

### 6.1.5.5 Teams and people

People involved in projects, according to Mr. Wu, usually include one or more software engineers, a project manager, and stakeholders or a "contact customer". Because their customers are other employees within the same company, everyone in the development team normally meets the customers. Some developers also visit the customers and spend quite a long time on site. The customers are perceived to be very helpful and co-operative. If customers are in other countries, they have to use other methods such as net conferences. It is, however, not perceived to be a good way to collect information, compared to face-to-face meetings. For bigger and more important projects, some developers also travel abroad to visit the customers.

### 6.1.5.6 Usability work

The usability work was mainly discussed in the interview with Mr. Zhu. According to Mr. Zhu, the HFE department should, in theory, participate during the whole development process. In practice they do not, but are asked to participate when the development team thinks that they are needed.

When discussing user involvement, Mr. Zhu distinguishes between end users and customers. A customer is defined by Mr. Zhu as the person who orders the system, which means that it is always someone within the same company. An end user, on the other hand, can be someone outside the company, for example someone who visits the company's web page. This differs from Mr. Wu's definition of customers, where 'customers' and 'users' are used more as synonyms. Mr. Zhu described that in the last projects in which he participated, there were no end users involved in the requirements phase, partly because the end users were in the USA, which made it more difficult to meet them. Requirements were gathered in meetings with customers when they discussed what was needed. However, he feels that it is important that the end users take part in the development process.

A problem is that normally their customers have not heard the term 'human factors'. Sometimes they have heard about usability, but often they do not know anything about these things. Since the company traditionally developed products for which there was no user interaction, usability issues were then not considered relevant. This is one of the reasons why many of the software engineers in the company do not know anything about user-centered design or usability work, and he has to explain to them what it is and what can or cannot be done. This last fact is the only thing he considers a problem in communication with others involved in the development work.

However, he also felt that usability work would probably be easier if more people working with these issues had a technical background. He explained that most people doing usability work in China today have a background in psychology or design, and that he did not know of anyone with a technical background. Within the company they sometimes have training in user-centered design for their developers. The developers often think that this is good in theory, but that it is difficult to do in practice because it takes time, money and resources, and because it means that more time has to be spent on coding.

Mr. Zhu claims that it is easy to find users, but that it can take some time. There are two ways

in which they get in contact with end users. Their user experience research team in the USA uses a third company in the USA to find users, and this company can also be used to find users in Shanghai, though of course it will be more expensive. They can also find users themselves, for example by advertising on their web site. Participants are always paid by the company.

## 6.1.6 Company 6

The last interview, with Miss Johansson from Sweden, was conducted at the company's office. She has a technical background including studies in interaction design and HCI. Miss Johansson works as a technical writer and has been working for Company 6 for a year. Work tasks include for example writing user manuals but also some usability work, especially helping colleagues with the design of user interaction and user interfaces.

### 6.1.6.1 The company

Company 6 is a large Scandinavian company which develops systems for mobile communication. It is structured into three main units: business units, market units and R&D units. The market unit is responsible for market analysis, the business unit develops commercial products, and the R&D develops products for internal use. Miss Johansson works for the R&D department in Shanghai, which has about 250 employees. Company 6 also has several offices in China, and most of the managers are Chinese. The company's headquarters are in a Scandinavian country, while the official language within the company is English.

### 6.1.6.2 Products

Some of the products the company develops are mobile positioning products and content delivery systems. Miss Johansson is working on something called ICP which consists of a software platform and a client that will run on the platform. Users can use the product to develop their own clients.

### 6.1.6.3 Customers

Their customers are at the moment only internal, mainly operators. Right now they have no Chinese customers. Products are developed for a global market.

### 6.1.6.4 Development process

Company 6 has its own model for development, which is used globally. The development process consists of the following phases: requirements analysis, design, development, implementation, verification, and release. Parts of the process are similar to RUP.

The R&D unit where the interviewee works is not directly involved in defining the requirements. This is the responsibility of the business and market unit. The business unit predefines what requirements they think the users want, and they also have direct contact with customers and conduct interviews as part of the requirements analysis. The market unit also gathers some requirements. After this step, the requirements are sent to the R&D unit. The R&D unit checks the requirements and analyses them together with the business unit, discusses if the requirements seem reasonable and sometimes adds some own requirements. After that the implementation starts, and this is the responsibility of the R&D unit.

The requirements document normally includes a section with usability requirements, but this depends on the kind of product. If there is no real interface or user interaction, this section is excluded. Otherwise, usability experts are involved in the requirements phase to discuss the requirements and check that requirements are reasonable.

Their products are not tested with end users. Instead they have a list of requirements and check that the product meets these. Requirements that are not related to usability are checked by system managers. If interviews with customers were done in the requirements phase, people who did the interviews also check the product to see that the requirements are met. Miss Johansson also feels that since they deliver their product in increments, this can be considered a kind of test. They get feedback based on the earlier increments and can use this feedback to improve later increments.

Users have been involved in testing of other products. The ways in which users are selected depend on how confidential the project is considered to be. For more confidential projects, users have to be selected from internal employees, but there have also been tests with external users. Miss Johansson could not tell any details about how this is done or how users are found, but explained that there are user profiles describing what kind of persons they are looking for. If the product is developed for specific customers, some of those are involved.

### 6.1.6.5 Teams and people

The R&D unit has no direct contact with users. Instead, this is the responsibility of the business unit, which for example meets users to do interviews. The interviewee is the only person in the Shanghai office who works with these issues. When they need to do interaction design, some interaction designers from offices in other countries temporarily join the team.

When asked if the developers in the company get any education about HCI issues, the interviewee said that there had been plans to let her organize a course for her colleagues, but this was cancelled because she would soon leave Shanghai to work at the company's office in another country. However, she feels that the others have become more aware of these issues since she joined the team. An example of this is that now they ask her for advice about the design of user interfaces, which they did not do in the beginning.

## 6.2 Usability experts

To be able to investigate how usability experts work in China we needed to include interviews concerning their work, and how they feel that the Chinese people react to usability work and different methods used, or potentially used.

The aim of this interview was not to get information for a later analysis of the company's UMM level, but to get some expert opinions on how to conduct usability studies and user-centered design in China. We met Mr. Wang who works as a usability expert and project manager within the company. He has studied industrial design and has now been working for the company for about one and a half year, including internship placement.

This interview took place at the company's Shanghai office, which also functions as a simple

usability lab. The lab is a room with a darkened window for monitoring the users. It is also equipped with cameras and computers.

### 6.2.1 The company

The company, with headquarters in another large Chinese city, employs around 20 people in total. When its first office was established in the end of 2001, it was the first company in China to specialize in usability work. Today it has offices in Shanghai and two other cities in mainland China. The Shanghai office, established in October 2005, employs three persons: Mr. Wang, a designer and an administrator. Since the Shanghai office is quite small and recently established, people from the company's headquarters usually accompany them in their work. At the moment the Shanghai office does not have any own projects.

### 6.2.2 Services

The services offered include user studies, interface design and usability testing. Of these three, the most asked for is the user studies, whereas they do least of interface design. Sometimes the company delivers a package of all three services. User studies are then conducted in order to get new ideas for design, followed by interface design and finally testing with users. However, according to the interviewee these tests are not really usability testing, but for example they compare a prototype with an existing product or compare two existing products with each other. The company does not want to conduct market research since there are already many companies that offer this kind of service. Instead, the usual work includes for example defining user profiles and conducting deeper studies concerning a focus group's needs.

The company also develops its own usability tools with a strong influence from Europe and the USA. However, Mr. Wang could not reveal any details about the tools they are developing.

### 6.2.3 Customers

Most of the customers are companies in Beijing, including both large international and national organizations. The most important customer is a Chinese organization which develops televisions, fridges and other home electronics. They also work together with a Scandinavian company within the same field, located in Shanghai.

### 6.2.4 Competitors

According to the interviewee there are currently only two to three companies in China that specialize in usability and user-centered design. Mr. Wang also mentioned some design groups that focus on graphic design, and that Human Factors International also has an office in Shanghai.

### 6.2.5 UCD work

The company's employees have backgrounds in design, psychology, sociology, engineering and statistics. Normally they do not work as lonely consultants in customer organizations, but instead many of the employees participate in the projects. The usual set up is that the

company gets an assignment from a customer organization and its employees work as a team to bring out the best solutions. In most of their projects, the customer organizations know very little or nothing about user studies or usability work. In these cases the company proposes different approaches to the customers

The company has established long term relations with some of their customers, and in those cases usually joins the development process in an early stage. New customers, on the other hand, usually contact the company only when they meet problems with their current products and need help, for example with redesigning a product. The company tries to suggest to these customers that by engaging usability experts in earlier phases they could avoid these problems, but the usual response is that deadlines and budgets do not allow it. However, as awareness of user-centered work is increasing, more customers contact the company in early stages of the product development.

Most of the methods the company uses are the standard user-centered methods developed in Western countries. The literature and theories they base their work on are also from the Western countries. The founder of the company was educated and worked in a European country, and brought many of the ideas concerning usability and user-centered work with him back to China.

### 6.2.5.1 User studies

User studies are normally done in the beginning of a project and include such things as defining target groups, constructing user profiles, defining requirements, analysis of the work environment, and task analysis or workflow analysis[41].

Users participating in the studies are usually collected from databases. The company keeps databases of users they can contact, and they sometimes work together with market analysis companies to find the right users. Still, the company finds it quite hard to find users, and often they use their friends and family members as focus groups. Mr. Wang feels that even if they try to focus on end users, the methods used now are not good enough and more work needs to be done to find the right, more representative users.

So far the products that they have worked on have been commercial products and users mainly regular consumers. They have rarely been involved in the development of products that are intended to be used by a specific user group, such as a system that would be used to support a specific group of people in their work. Only in one of the projects did they have a more specific user group. The product was a home network system, and for that study they needed to contact villa owners, which turned out to be a difficult task. This was mainly because the rich villa owners were not interested in joining a study, and it did not make any difference even if a financial reward was proposed. It is quite normal that the company rewards the focus groups financially, even the friends and family members. In this case, the only way to get access to users was with help from their personal contacts.

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[41] Work flow "defines how work is broken up across people and how people coordinate to ensure the whole job gets done". It describes for example how tasks and results are passed between people, whom a person needs to cooperate with in order to perform tasks, and how responsibilities get assigned to different persons. (Beyer & Holtzblatt, 1998, p.90f)

Methods for finding out information about users and tasks include interviews and focus groups, where they for example show videos and ask participants about thoughts and feelings. Site visiting and prototyping is also used.

### 6.2.5.2 Interface design

User interface design consists of structure design, interactive design and visual design. Some of the interface design is done on site, if the customer asks for it. When the company joins the customer organization and works on projects on site, the first reaction from the developers is normally positive. However, if the company proposes changes, for example a more iterative development process, the customer organization often claims that implementing those changes would be too time consuming.

### 6.2.5.3 Usability testing

Usability testing is normally based on hi-fi prototyping[42]. During usability tests with users they for example use think aloud protocols. The company also uses eye movement tracking[43], although this is mainly done at the company headquarters where they have a more advanced usability lab. Other kinds of evaluations measure the amount of mistakes the user commits. They also conduct interviews to let users express their opinions and feelings. Sometimes they also use methods that do not involve users, such as heuristic evaluation. Which methods they use depends on what type of application they are testing.

## 6.3 Chinese culture, management and UCD

In the final results chapter, we include some interview results and observations concerning the state of usability work in China today, the Chinese work culture, and how the Chinese culture affects usability work.

### 6.3.1 Usability work in China

In our interviews, several of the interviewees mentioned that usability work and user-centered design is just about to be acknowledged in China. Some examples of these changes were given by Mr. Zhu from Company 5, who described what the situation was like a few years ago when he was still studying and it was much more difficult to find a job because very few companies were interested in usability. He claimed that in the last two or three years this has changed, so that today most of the multinational companies represented in Shanghai have usability departments there and many Chinese companies are beginning to get interested in those issues.

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[42] Hi-fi prototypes are normally computer based. Such prototypes are therefore similar to the final system, both in looks and in how the interaction functions. They are useful in certain kinds of usability tests, for example when measures of how long a certain task takes to perform are important. A problem is, however, that users often do not want to critizise such prototypes or suggest changes because the design is perceived to be 'finished'. Since relatively much work is spent on developing the prototype, designers and developers can also be reluctant to throw it away. In contrast, so-called lo-fi prototypes, usually paper sketches, are cheap and fast to develop, and design changes are easy to make. (Johansson, 2003)

[43] The device registers for example which objects a user is looking at and measures the time spent looking at each object.

An important reason why the discipline of HCI discipline is receiving more attention now and people are starting to consider these matters, according to Mr. Wang from 'usability experts', is the Western influence in major cities like Shanghai and Beijing. He also gave some examples of the changes in China, including that many larger companies are establishing their own usability teams, international organizations start networks in China, and seminars are held.

However, Mr. Wu from Company 5 claims that although there seem to be more awareness of usability issues now, very little actual work is done. He means that a common problem is that usability expertise is not integrated in the whole development process, but is used only when the customers need some minor things to be fixed.

Another problem, described by both Miss Johansson from Company 6 and Mr. Wang, is the lack of formal higher level educations within HCI and that HCI as a science has still not quite found its way to the technical university departments such as computer science and engineering. According to Mr. Zhu, people doing usability work usually have a background in either psychology or design, and Mr. Wang said that most of the usability experts he knows have backgrounds in graphical design or industrial design. Miss Johansson explained that when the company was looking for someone to replace her, it was very difficult to find someone with the right education. It was also difficult to explain to the Chinese recruiters what kind of background was needed, since they thought that they should hire a person who had studied cognitive psychology. She believes that to do usability work it is important to know something about technical issues, and this technical knowledge is normally lacking among psychologists.

In the interview with Professor Guo from Tongji University, we also got some information about how usability work is done in China today, and about the attitudes toward HCI and user-centered design. When talking about the typical development work in China, Professor Guo said that requirements for a new system are usually gathered in meetings with management of enterprise, system operators, and end users. The problem with involving users, in his opinion, is that they seldom know what they want. Professor Guo also claims that HCI is mainly a philosophy and only partly science. According to him, the concepts of HCI are not yet implemented within industry but merely within the academic world, because the discipline is not yet mature enough. He thinks, however, that it is quite natural that the development processes of commercial products concentrate on users, since the products are always developed to serve the users' needs and the users have to like the product in order to buy it. So according to this point of view, the user-centered development is very natural. However, he feels that the methods needed are market analysis and requirements analysis, but that to integrate HCI in the development work is something completely different.

### 6.3.2 Chinese work culture

A lot of information about Chinese culture has been collected in informal interviews. For example, a Western acquaintance working within IT told us an example of how people in different cultures may have different approaches to new situations. The person was to hold the first meeting with a group of Chinese soon-to-be-colleagues, and when attending the

conference room he took a seat next to the table. When his new Chinese colleagues arrived they immediately took places opposite of him, so that the only Westerner was facing fifteen Chinese business men. For him the situation was odd, and he spent time and energy on replacing the colleagues around the room, so that the space would be better filled and the sitting arrangement would feel more dynamic and co-operative. However, there was no joining in his conversation; the very situation made him the leader and the other the listeners. This was something the Western acquaintance found very unfamiliar regarded to his cultural background.

Another acquaintance working in a Scandinavian company told us about the many situations where he felt that his Chinese co-workers showed a lack of commitment and ability to think for themselves. When their project manager had a meeting with the project group, everyone simply agreed on the work tasks, but after a while, the Chinese employees still had not started with their tasks. He described that they did not take any own initiatives or started anything by themselves, but instead waited for the manager to tell the exact steps to be performed. He also explained that many times when the manager was not around, the employees cut the work, played games or even did not show up at all.

During the research, we also tried to get interviews with the customer organizations of the companies included in our study. For example, we got in contact with one of the customers of Company 1 and wished to get some feedback from them concerning the HR system that they had bought from Company 1. The customer organization explained that the HR system they bought is not performing as well as anticipated, but since they had already bought the system, they also had to buy another system (for the financial department) from the same company. They felt that if they had used another vendor, they would have caused Company 1 to lose face. Although we would have liked to talk more about this with the customer organization, they refused to give us any more details.

An interesting observation during the research project was that of the importance of guanxi. Some of the potential interviewees had heard about SESUN, and were more interested in participating in interviews when they heard that we did an implementation study for SESUN. It seemed like they then thought of us as part of an international network, and not only as two foreign students.

Cultural differences were also discussed in some of the interviews with companies. Some differences between working with Western and Chinese people were mentioned by Mr. Wu from Company 5. The most important difference, in his opinion, is that Western people are more result-oriented, while Chinese focus more on interpersonal relationships. Chinese care about *how* things get done, not only *that* they get done. For this reason, he felt that he gets to know the Chinese customers better, they talk about more personal things and even sometimes become good friends, something that never happens with the Western customers.

Mr. Wang from 'usability experts' also experiences important differences in working with Western customers compared to Chinese. In his opinion, the main differences concern company cultures and management skills. He perceives most Western companies as more demanding when deadlines and results are concerned. According to him, a problem when working with Chinese customers is related to hierarchy. Although he does not experience

small Chinese companies as very hierarchical, he means that the hierarchical system is evident in larger Chinese companies. An example of this is that customers from these companies are not always able to make a decision about design proposals, but have to pay the question forward to higher levels in the company hierarchy. Due to the hierarchical systems in Chinese organizations, top level managers also need to be present on all the meetings that consider development. If top level managers are not attending the meeting, it can be very time consuming to reach a decision. For example, they might not be able to make a decision about which of two design solutions is the best, and even if a decision is made, it could be changed later if the manager has a different opinion.

### 6.3.3 HCI and UCD related to Chinese culture

According to Mr. Huang from Company 2 there are some ways in which the Chinese market differs from the global market, and this affects the design and development of products. An example of things to pay attention to when developing products such as search engines, which is one of their products, is that some words are censored in China. He also thinks that it is possible to identify special user characteristics among the Chinese users, for example that certain pictures are not culturally suitable in China. Some differences between design for Chinese and Western users was also discussed by Mr. Wang. As an example, he explained that Chinese web sites are in general 'messier' than those designed for Western users and that Chinese users are used to finding more information on the site, compared to the Western users. The sites often contain more graphics, flash animations, colorful texts and blinking objects, while sites for Western users are more neutral and 'clean'.

Mr. Zhu from Company 5 claims that another important thing when developing for the Chinese market is that there can be a difference between user segmentation in China and in Western countries. This means for instance that when user groups are identified in a Western country, it can sometimes be difficult to find the same or equivalent groups in China.

A problem when doing usability work in China is, according to usability expert Mr. Wang, the Chinese users' desire to give 'correct' answers. It sometimes happens that test participants ask whether their answers were good enough. Mr. Wang experiences Chinese customers to be quite neutral, as they wish neither to criticize nor to give compliments. In contrast, he thinks that Westerners are more eager to speak their minds. This problem was also mentioned by Mr. Zhu, who claimed that Chinese users are different compared to people from Western cultures and always have very few comments, which means that he has to encourage them to express opinions. They are also always concerned about the purpose of the test and need to be told that the test is not about them, their capabilities or their IQ, but about the product.

During the interview with Miss Johansson, she mentioned that Chinese employees usually do not question their managers they way people do in Scandinavia, and they do not have the same kind of open discussion with their managers. She believes that this could also be a problem when doing usability work such as evaluations with end users, since people are often not used to discussing and questioning. Professor Guo at Tongji University also talked about Chinese users' reactions when they take part in evaluations. Many developing organizations use prototyping to get user feedback, but often the Chinese users are far too shy to comment the system. He feels that sometimes it is easier to get honest feedback when the discussion is

held individually with each user.

Due to the cultural differences, Mr. Wang thinks that there is a need for more research on the theories concerning user-centered methods, since most of these methods are developed in the USA and often not perfectly suitable for Chinese users. Although he claims that the methods themselves, such as usability testing methods, can be used in China as well, he thinks that there are theoretical questions such as the amount of representative users needed which raise the need for more localized knowledge.

# 7 Discussion

*Finally, we present some conclusions and reflections about the interview results we have gathered during our work in China. These reflections concern usability work in Chinese organizations, the Chinese culture as well as company cultures. We also present some suggestions on how to improve usability work in software companies in mainland China. This chapter is structured according to our three main research aims.*

## 7.1 Usability work in China

Where are the software organizations in China when it comes to usability, user-centered design and maturity of usability work? As stated earlier, answering this question was one of the aims of our research. One of the hypotheses at the beginning of this research was that companies in China in general do not work user-centered. It was also assumed that the IT companies in China were beginning to get more interested in these issues, but that in general the non-Chinese companies would be more aware of usability work, compared to the Chinese enterprises. We approached the question about the state of usability work in China by conducting face-to-face interviews with some of the IT companies in Shanghai. An interview with one of the few expert firms working with usability in China was also included in order to see how these experts work with companies in China. This was done in order to get more ideas about how usability work within the companies could be improved, as well as to get more information about the state of the IT industry based on information about the usability experts' customers' attitudes toward and knowledge about usability work. As usability experts should be the leading in applying usability methods and principles, we also wanted to see how these firms work, what methods they choose and what kind of obstacles the Chinese usability experts face today.

As discussed earlier, a previous study of usability maturity indicated that in 2002, leading IT companies in China had reached no higher than the UMM level A. Have things changed since then? In short, the answer is: not much. Based on our results, and as will be discussed in the following UMM analysis, the level of usability work is still quite low. Anyhow, interview results and observations indicate that there is growing interest among organizations in mainland China and especially the larger companies have started to improve their usability work processes.

### 7.1.1 UMM analysis

We approached the companies with an interview guide that was based on the theory of usability maturity of organizations. The UMM-HCS that we use for the analysis of the companies' usability level is a model derived from other maturity models such as the CMM. As stated earlier, there is no direct connection between the CMM and usability work; however, the CMM level describes the level of work process maturity, and one of the expected outcomes of improving process maturity is better product quality. In theory there should therefore be some connection between product quality and the CMM level.

Our results show that the CMM level and the level of usability maturity do not have to be connected. Some of the companies included in our study had reached a high CMM level but were still on the lower UMM-HCS levels, whereas a small, new company (Company 4) just

on the initial level of CMM was working more user-centered than many other companies. This study therefore supports the conclusion that even though an organization is assessed to be on a high CMM level, they do not necessarily see usability as one of the quality criteria for their products.

### 7.1.1.1 UMM-HCS level A

The UMM-HCS level A describes business organizations that recognize the need of improving the usability of their products. Both the managers as well as the staff members are aware of the benefits of producing usable products. The organizations collect information about users, and this information is then used to improve system requirements.

Most of the organizations included in our study acknowledge the need of improving usability. Interviewees from four of the companies state that usability work is important and seem to be aware of the benefits of producing usable products. They also use different methods for collecting information about users. It is, however, not clear how widespread the awareness of usability issues is and if the whole staff knows of the benefits of usability. In this assessment we therefore focus on whether there seems to be some awareness within the organization, but assume that this does not cover the whole staff. A more detailed analysis of the companies' methods and attitudes shows the following:

The first of the companies, Company 1, hardly reaches level A. It does not collect any information about real or potential users, their specific needs or characteristics. End users are not involved in the requirements phase, and only market analysis is conducted to gather priority requirements concerning perceived market needs. Information is collected from users, however. Feedback on early versions is collected via the company's support team and is used to improve requirements for later versions. Focusing on improving usability does not seem to be the first priority. The organization's human factors team only handles interface design and, based on the description given in the interview, the impression we get is that it is a design team rather than one that is responsible for usability issues. Company 1 agrees with the user-centered design ideas in theory and claims that the company realizes the benefits, but argues that they cannot work according to user-centered principles, as aspects such as money, time and lack of resources are considered more important. This probably indicates that the benefits of usability work are not completely understood.

In similar to Company 1, Company 2 collects information from users, such as feedback on products, but their team of interaction designers also collects information about users. The collected information is then used to improve the products. According to the interviewee the organization acknowledges the importance and benefits of usability, and all teams are supposed to work towards these goals. Their team of interaction designers is not only responsible for design issues but for user contacts and usability testing as well, which also indicates that the organization tries to improve the usability of the products. We draw the conclusion that the organization has reached level A.

The interviewee from Company 3 is not familiar with terms such as usability and user-centered design, which probably means that this is not discussed within the company and that consequently the staff in general might not be aware of usability benefits. Regarding the

collection of information about users, the user contacts are handled by employees in Japan where the engineers work on site. These employees participate in requirements gathering, but since we do not have any specific information about how this is done, it is not possible to say if any information about users is collected. However, it seems likely that the company does not fulfill the requirements for level A.

We conclude that Company 4 has reached level A. It collects some information about users, although mainly with help from a market analysis company. Market analysis is used to get basic information about potential users, such as information about users' interests. The information that has been collected is then used to define requirements and for product improvements. Besides information about users, feedback from users concerning the first version of the product is collected and used to define new requirements for the next version. There also seems to be a general awareness of usability in the company. The interviewee emphasized the importance of usability and claimed that everyone in the company is supposed be aware of usability issues.

We also state that Company 5 fulfills the requirements for level A. Users are involved in the requirements phase to get most of the ideas about how to work and what to do. Some user background research is also done. Sometimes information about users outside the firm is collected as well, for example if the system that is developed is a website or intended for marketing. Information that is collected is used when requirements are defined. Company 5 also gives the impression of being aware of usability issues. According to one of the interviewees, all of the developers meet users and some of them spend a long time on site. The second interviewee, however, mentioned that many of the developers he has worked with do not know much about user-centered methods and that management is not always willing to spend money on these issues. The fact that the HFE department only has two employees, compared to the 2000 employees at the R&D center, could also indicate that usability work is not given the highest priority. This situation will improve if the company invests in the planned usability center in Shanghai.

In Company 6, employees at the business and market unit collect information about users and define the requirements based on this information. The amount of information that is collected depends on the type of product. The product that the interviewee was working on is special since it does not have a real user interface, but more information is collected when the company develops more interactive products. Company 6 also acknowledges that usability issues are important, although parts of the staff are probably not aware of these things. The interviewee's colleagues, for example, did not know anything about usability issues before she started working there. However, our conclusion is that Company 6 also reached level A.

### 7.1.1.2 UMM level B

Companies on level B are aware that usability is a particular part of the system and that it can be improved. Staff and managers acknowledge that human-centered development should cover the whole system, not only the interface. The staffs are aware that usability is achieved through the use of human-centered development, that end users should be considered during the development, and that the users' skills and backgrounds may differ from the developers'.

Several of the companies have also reached this level. The companies that did not manage to fulfill all the requirements for level A, Company 1 and Company 3, do not reach level B. In Company 1 no user-centered development methods and principles are applied, according to the interviewee. Interface design is done separately by a human factors team that is not directly involved in other stages of the development process. End users are hardly considered, and instead they are represented by buyers and product specialists who are supposed to know what the users need. The impression is that staff in general is probably not aware of user-centered design.

Concerning Company 3, awareness of usability and user-centered development, as discussed, appears to be low. The development done by the employees in China does not involve users in any stages of the process, but the interviewee mentioned acceptance tests, and it is possible that users in Japan are involved in these. It is possible that the results for Company 3 could be explained partly with the fact that parts of the process are done in Japan and therefore the interviewee could not tell us about any usability work that might be done there. An assessment including employees working in Japan would perhaps give other results. However, we have no information supporting that the company would have reached level B.

All of the other four companies have more or less reached level B. Starting with Company 2, the company seems to be aware of usability issues and that user-centered design should be used to achieve usability. They also use some methods for improving usability, such as usability testing. Staff is supposed to be aware of usability and users' needs. However, the interaction design team works rather isolated, and it is less clear if the other teams in practice focus on end users or work according to user-centered principles.

Company 4 also seems to be aware that usability can be improved by the use of user-centered design methods. They try to gather information about and test with real or potential users, which should indicate that they are aware that end users' needs or characteristics differ from the developers and that they try to focus on end users.

Although not all of the developers seem to be aware of user-centered ideas, there seems to be awareness within Company 5 about usability and that user-centered design can be used to improve product usability. End users seem to be considered during development, and the fact that some developers spend time on site means that they are probably aware of differences between developers' skills and characteristics and those of the users.

The situation in Company 6 is also that the company in general seems quite aware of the importance of focusing on users, although not all of the Chinese employees are aware of usability issues. However, the user-centered ideas seem to be applied mainly for interfaces. There are, for example, no usability requirements for some of the products.

### 7.1.1.3 UMM level C

It looks like organizations in China do not come any further in usability matters. The next level, level C, is distinguished by active user involvement in the development process. Companies on this level perform tasks and tests with users continuously and at all the development stages. Our research did not show any signs of this. Even the better performing

companies, such as the American Company 5 and the Scandinavian Company 6, still do not include user testing and involvement in all the stages.

## 7.1.2 Conclusions about usability work, problems and attitudes

The results from our study indicate that companies in China are still on a low level of usability maturity, which confirms our first hypothesis. This was expected, since introducing usability work is likely to be a slow process. It does, however, seem like the situation is slowly getting better. Still, the situation is far from ideal and many things can be improved.

### 7.1.2.1 Attitudes toward usability work

Our second hypothesis about the interest in usability and user-centered work also seems to be confirmed, although some results indicate that it could be more a question of agreeing with the ideas in theory than a will to follow the principles. Although almost all of the companies seem to acknowledge the importance of usability and user-centered design, at least in theory, it seems like other things are often prioritized in practice. To some of the companies, technology and time to market seem to matter just as much as, or more than, quality, and usability does not always seem to be considered one of the most important measures of quality. Lack of time and/or resources are mentioned as reasons for not implementing changes that would make the processes more user-centered. This indicates that the understanding of the benefits of user-centered methods and how problems can be solved by adding user-centered methods and principles might still need to be improved. This is probably true for both management and developers within the companies.

The interview with the usability experts firm also gave some information about the understanding of and attitudes toward usability work in China today. For example, the interviewee explained that few of the customer companies were familiar with usability issues, which indicates that the knowledge is probably still not widespread within the industry. It is also interesting that there are still very few companies that specialize in usability work. One possible explanation for this is that the demand for such services still has not developed much.

The interviewee from the usability experts also mentioned that many customers do not contact them until problems have occurred, which shows that many companies have not understood the value of introducing usability expertise from the beginning of the development of their products to prevent the problems from occurring. When the firm is asked to define requirements, usability experts are of course involved in the early phase of the project, but usually they are not asked to also participate in later stages of the process. Normally, they do not follow the whole process, but are only hired to solve certain problems. The customer companies do not seem to realize that user-centered methods and ideas would give better results if they were integrated in the whole development process. It still seems relatively unusual for companies to include usability expertise early and continuously, and it is mainly when long-term relations are already established.

### 7.1.2.2 Usability work as market analysis

The usability experts are often hired to define requirements, while they are less often asked to do design. A possibility is that their customers see usability work mainly as a complement to, or a kind of, market analysis. Since many of the IT companies are probably used to using

traditional market analysis companies during the requirements phase, involving usability experts to define requirements might not seem like such a big change. Design, on the other hand, has probably in many cases been done by the companies' own developers, meaning that the companies are less used to hiring external experts to do this and might be less willing to spend money on involving a usability expert firm with new ideas about how design work should be done.

Some of the interviewees also seemed to relate usability work to market analysis, which supports the conclusion that the understanding of user-centered design might be less developed in practice than in theory. To study the specific users, their tasks, environment, needs and characteristics is a central idea in user-centered design, but in many of the companies in our study, an analysis of the potential market needs is done instead of a comprehensive study of real or potential users. Information from market analysis is normally based on demographics and market characteristics, and only doing market analysis means that no detailed information about user characteristics or the context of use is collected. The main thing that is being analyzed is that there is a market for a new product or version, meaning that there is a risk that the companies miss a lot of information that would be relevant to the development of a usable product.

**7.1.2.3 Problems with the usability work**
Compared to the situation in 2002, it seems like companies are getting better at considering users' needs, but some of the problems remain. User involvement and communication with users is still a problem, as well as the fact that users are only involved in certain stages of the development process. When users or customer representatives are involved, it is normally for defining requirements or for testing in the very end of a development project. Designs do not seem to be tested or discussed with users, and users seem to be excluded from the design and development phases. Although tests are in many cases done with customers, these tests rarely involve real end users, and the tests are usually done in the end of the development, often focusing on functionality. Prototypes are still normally not used for tests, and some companies claim that they use prototypes mainly for internal communication and analysis. Companies in general also do not seem to work iteratively, but the processes used generally resemble the Waterfall model.

Another problem concerns the lack of multidisciplinary teams. It appears that the different teams within the companies usually work quite isolated, focusing on their own areas. In several cases, communication between teams involved in development work is mainly via managers. In the cases where companies have special teams handling usability or interaction design issues, those are not involved in the whole process but only handle certain tasks. The rest of the staff's awareness of usability issues is less certain. As a result, usability work is not integrated into the whole process. This is a potential problem for knowledge sharing, and a probable consequence is that there will be less focus on usability. Only Company 4 claims that all employees should be aware of usability. One reason for this could be that the company is relatively small, which could lead to less strict separation of work tasks and better communication due to less hierarchy.

The user studies that are done by the companies give the impression of being more about

identifying some user characteristics and tasks or needs, and less about analyzing the actual environment in which the system will be used. Usability tests, even those done by the usability experts, seem to generally be done in labs, even though the more context dependent aspects of usability are difficult or impossible to measure in the 'artificial' situations in labs. Another problem concerns that in many cases real end users are not involved, but instead there will be customer representatives such as buyers, or simply friends or relatives. While this is, of course, better than nothing, it is not ideal.

### 7.1.2.4 The lack of HCI educations

Some interviewees said that the lack of usability work is at least partly a result of lack of education within the subject. This can lead to several problems. For example, when the companies want to hire new employees, it is difficult to find people who have studied HCI-related courses. Although several higher education institutions give courses in usability and related subjects, these tend to be design and psychology schools. Very few engineering and computer science colleges and universities offer courses about usability. One reason why the industry does not seem to take the subject very seriously could be this lack of usability courses in technical universities.

Interviewees who worked with usability in large organizations also witnessed the problems with lack of authority that can be the result of lack of knowledge about technical issues. It also seems likely that the reason why the two interviewees from Company 5 experienced the usability work done within the company somewhat differently is related to their different backgrounds: psychology and computer science. Most of the people working in software development teams are technically educated, and might show less respect towards a psychology educated person's ideas about development work since his/her knowledge about computer technology is not the same as theirs. A person who understands the way the technology works and can communicate with developers about technical issues probably has a better chance to make developers listen to and consider his/her ideas.

### 7.1.2.5 Differences between the companies

Our third hypothesis concerned the differences between companies. We expected the multinational companies to be more aware of usability principles and comply with them to a higher degree. In general, it also seems like the non-Chinese enterprises are more focused on user-centered development. However, some exceptions exist. The Chinese Company 4, for example, belongs to the best performing companies, while the American Company 3 seems to perform worst. The other Chinese company, Company 1, fits the hypothesis better, and so do the other multinational companies. A possible explanation for the Company 4 result is that a young, small company might be more open to new ideas and therefore shows more interest in user-centered development. The results for Company 3, on the other hand, could probably partly be explained by the fact that the users are situated in another country and employees in the other country handle most of the issues concerning users and usability, while employees in China mainly do the coding.

The different situations in the companies could also perhaps partly be connected to the different types of products they develop and who their intended users are. For example, since the interviewees from Company 5 develop systems for the company's own employees, this

probably makes the user contacts and collection of information about specific users easier. Companies developing for 'the general public', such as Company 4, might feel that it is more acceptable to involve friends and acquaintances in studies of and tests with potential users. In the case of Company 4, it also seems likely that many of their friends actually belong to the target group. The interviewee from the usability experts also explained that one reason was that so far they have not developed systems that were intended to be used by a specific group at a specific work place. However, even when developing systems for the general public, it is still possible to study representative users and the context, for example the way the company did when developed the home network system.

## 7.2 Conditions for usability work in China

Our second research aim was to investigate and discuss the conditions for usability work in China. As our results have shown, there are certainly factors that affect the conditions for usability work. We have brought up the notion of culture as one of the main factors. The Chinese culture is a very old culture with significant features. As we have discussed based on the theories by Professor Hofstede, there are several important differences between people in Scandinavia, in the USA and in China. One of our hypotheses was that we expected there to be difficulties associated with applying 'traditional' user-centered principles in China due to these cultural differences between China and the Western countries where the principles were developed.

Our results also indicate that the companies trying to apply user-centered ideas in China meet certain problems. It is possible that some features of the Chinese culture could be one of the reasons why the usability work in China is still on a relatively low level. It is certainly not the only explanation, and there are other important reasons such as the relatively short time that has passed since the concepts were introduced in China. However, there are features of the Chinese culture that we believe could contribute to making the introduction of user-centered ideas a slower process.

We also find it interesting that the multinational companies participating in our study have not reached beyond the UMM level B. The Scandinavian countries and the USA are well ahead in both usability and software development, and since the concepts of usability are relatively well-known in Western countries, we expected the multinational companies to implement these even when operating in other countries. On the other hand, as we have stated earlier, the host country's culture affects the company culture, resulting in differences in doing business compared to that of the home culture.

### 7.2.1 Culture

We have no doubts that the Chinese culture in many ways differs from the Western one. After living in China and interacting with the Chinese for six months we found many differences in peoples' ways of dealing with daily routines, both in their personal lives, in social environments, and in doing business.

Although China is in many ways modernizing and, at least on the surface, changing toward a more 'Western' way of doing things, traditional cultural traits and core values are still

essential. An example is that the rules and teachings of Confucius still affect most aspects of life in China. Confucius' teachings emphasized the importance of hierarchical relationships, but also stressed that harmony and stability should be preserved and the individual was seen mainly as a member of a collective. These aspects of Chinese culture are all relevant to usability work today.

We have based most of our discussions about Chinese culture on the theories developed by Hofstede. As we discussed in chapter four, Hofstede's five dimensions can be used to describe and analyze the differences between countries. The dimensions were also used to identify some potential problems with usability work in China. These will be discussed in relation to our results in the following sections.

### 7.2.1.1 Power Distance Index (PDI)

China ranks quite high on the PDI scale. According to the theories by Hofstede, this means that inequality is accepted and that the typical Chinese work places are hierarchically structured. In a high-PDI country, managers decide without consulting subordinates, and employees are supposed to follow orders without questioning.

Our own observations and interview results agree with this. There are, of course, important differences between the organizations that we have studied, depending on the size of the company and the country of origin. In general, however, work places seem to be more hierarchical compared to for example the work places in Scandinavian countries.

Based on the fact that China scored high on the PDI scale, we identified some potential problems for usability work. The first main problem discussed was that in this kind of culture, people are probably less likely to accept arguments based on the idea that users have a democratic right to participate in the development of systems that they are going to use, or to agree on the importance of consulting end users. This could also lead to problems with getting access to users, if managers in the customer companies do not see why the end users should be consulted. As we mentioned in the introduction, Chinese organizations are not used to including stakeholders in the decision-making, and Chinese in general tend to have a different view toward human rights and work environments than people in the West. When users' rights to work in healthy environments, safety at work, and satisfaction toward the system are not considered during the development process, the product is likely to be less suitable for the actual users.

As some of our interviews also indicate, in more hierarchical organizations it might be perceived to be enough if managers decide what is needed from the system or which design solutions are the best. Even if others are officially involved in the decision-making, it is far from certain that their opinions are taken seriously or affect the decisions. This was for example shown in one of our interviews, where the interviewee explained that the manager was the one who made the decisions, no matter what had been agreed earlier in meetings where the manager did not participate.

In general the companies included in our study do not seem to find it very important that real or potential end users are consulted. It is usually not end users but customer representatives

who participate. Company 1, which is probably the most 'traditional' Chinese company included in our study, does not include end users at all in the development. Since the company's products are systems that will be used for work, it would be possible to argue that the users should be involved in the development and should be given the possibility to influence the design of the system. However, the company perceives it to be enough if buyers and product specialists are involved, as 'they know what users want'. Product development also starts with a manager's idea and is based on market needs rather than what the specific users require.

Company 5 also develops systems that will be used to support work. In this case, users are consulted and there seem to be fewer problems related to involving users. This is probably partly because the users are other employees within the company, but perhaps mainly because of the company's more developed view on usability work. The company culture is also perceived as more Western than Chinese, meaning that the hierarchical system should be less of a problem in this company.

Several of the other companies seem to agree on the idea that users should be involved. However, both Company 2 and Company 4 develop systems for the general public and their reasons for considering users' needs are probably more related to business needs and wanting to attract or keep customers than based on the idea that users have the right to participate.

A problem that was not identified in the earlier phases of this research but that was found in interviews was that communication in these companies is often not directly between teams but done via managers. This also reflects the hierarchy and could affect usability work, since it hinders knowledge sharing and cooperation between for instance human factors teams and developers.

### 7.2.1.2 Individualism (IDV)

According to Hofstede's model, China's low IDV value means that China is a group culture in which the group is emphasized instead of the individual and an individual's opinions should not differ from the group he/she belongs to. As a result of this, it is seen as important to preserve harmony in the interactions with other people, meaning for example that a person should be polite and avoid giving criticism.

Based on this and that it could be considered impolite to say that a design is bad, we assumed that getting feedback from Chinese users would be more difficult and that methods requiring users to criticize would be less suitable. Another potential problem related to feedback is that in group cultures, authorities should not be questioned. It is possible that usability test leaders could be seen as authorities, especially if they are better educated or for other reasons perceived as possessing a higher status than the test participants.

The problem of getting feedback was also acknowledged by several interviewees. It was perceived that Chinese users are often neutral, neither giving praise nor criticism, and that for this reason it is difficult to get comments. In tests they are also eager to give the 'correct' answers and to give answers that are 'good enough'. One potential solution that was mentioned is that it is often easier to get feedback when discussing with the person

individually than when being in a larger group.

Of course, some of the companies get other kinds of feedback on finished products. For example, Company 4 collected feedback on the first version of its product. This feedback mainly concerned things such as that users wanted more detailed information in the messages they received. There could, of course, be several reasons why comments less often concerned the user interface. It could be simply because the interface is considered quite good as it is, or maybe because lack of information is seen as a more important problem, but this is also what could be expected based on what we know about the Chinese culture. It is probably seen as easier to suggest such changes as adding functionality than to say that the design is bad, since it is likely to be perceived as less 'insulting' and therefore lets both parties maintain face.

In the theoretical discussion in chapter four, it was also suggested that in many Chinese companies, employees who are 'forward' by making innovative suggestions risk being seen as too ambitious, and that many managers will not approve of this. This probably means that if user-centered ideas are to be introduced in a typical Chinese company, the need of support from management is even more crucial than if those principles would be introduced in a company in a Western country. Employees are typically not supposed to introduce such ideas, so the suggestion probably has to be made by a manager.

### 7.2.1.3 Masculinity (MAS)

China is classified as a masculine culture, according to Hofstede. Masculine cultures are more oriented toward industry and technology. Scandinavian countries, in contrast, emphasize service-mindedness, customization, and quality.

In our interviews we have found several signs of this. As discussed earlier, technology and time to market seem to matter more to some of the companies than quality, and 'soft' quality attributes such as usability are not always considered most important. It is possible that one reason for this is that they still do not really see the benefits of user-centered development, since these benefits are often very difficult to measure in financial terms. Although 'hard' measurements such as economical are considered important in companies all over the world, it is probable that this is considered even more central in a masculine culture.

It also seems to us that most of the usability work is quite technical, while there is somewhat less focus on acceptability and mental user experiences. For example, the usability experts firm uses methods such as hi-fi prototyping, eye movement tracking and measurements of error rates. Even the relatively user-centered Chinese Company 4 seems to associate usability with more 'technical' measurements of for example how long it takes to do something or the number of button clicks needed to perform a task. Of course this is also done in the Western countries, but it is maybe considered more important in China because it can 'prove' that what is being done is scientific and serious. Things that are possible to measure quantitatively might be taken more seriously in a masculine culture.

### 7.2.1.4 Uncertainty Avoidance Index (UAI)

In China, with a low UAI, the acceptance of ambiguity and uncertainties should be quite high, according to Hofstede's theories. Our impression from our time in China is also that people in

general seem to be open to new ideas, especially the younger people and 'younger' companies such as Company 4. The fast development in China right now also indicates that they are able to adapt to new ideas and ways of working. This attitude should probably facilitate the introduction of user-centered ideas.

### 7.2.1.5 Long-Term Orientation (LTO)

China is the highest scoring country of all on the LTO index. As we have discussed in chapter four, it has been argued that Chinese people tend to look for reasons for failure internally rather than externally. They feel that if something is bad, or goes wrong, it is their fault and not the system's. As a result, they probably try to adjust their work and accept the system faults, rather than criticize. We have argued that this could be a problem for getting feedback about system faults, and that another problem for feedback could be that Chinese users might not want to criticize because they would risk looking stupid and lose face.

It has also been mentioned by interviewees that Chinese people do not want to admit that they cannot use a system, purely based on the fear of losing face. Since it is also impolite to criticize design, Chinese test participants often prefer to keep quiet. A result of this is that Chinese users could seem to accept usability deficiencies better than the Western users.

The problems related to feedback were discussed in the section about IDV above. However, as has been mentioned, it should be noted that several companies get feedback on existing products, for example via support departments. This shows that users at least admit some problems related to the use of the system. Since we do not know what kind of problems make them contact the support team, it is difficult to say if this contradicts our conclusions in any way. There are also differences between calling or e-mailing a support department and giving criticism in a discussion face-to-face with a usability test leader. Since there is less personal contact in the first case, that might make it easier to admit problems or give negative comments on the product.

The concept of face is central in Chinese culture, and the loss of face is in this culture considered unacceptable. We have earlier argued that because of cultural differences, users from different cultures probably perceive the usability of a system differently. Usability criteria developed in the West could therefore be less applicable in China. We have also mentioned the idea that different cultures could show more or less tolerance for certain usability deficiencies. An example is that a system should not make its users feel stupid. This might be true for Western cultures, but based on what we know about Chinese culture and the concept of face, this rule could be even more important to consider when developing systems for Chinese users. If the system makes users lose face, it is not likely to be accepted by its users. Another example concerns how much information an interface should contain. One of our interviewees mentioned that Chinese users are used to interfaces that a Western user would perceive as messy and confusing.

## 7.2.2 Management

The company culture in the studied companies is mainly local. This is evident in Chinese organizations, but foreign organizations also tend to have more Chinese values and management style. Most of the interviewees described the company culture as Chinese. This

probably reflects the fact that most companies mainly hire Chinese employees. Three of the interviewees said that the managers and employees were all Chinese, and in two of the other companies, managers were all Chinese, just like most of the staff. The main exception is Company 5, where the company culture is described to be more Western than typically Chinese, and there are managers from different countries.

Within the Chinese organizations, communication between the managers and the subordinates seems to be more formal than in Western companies. In the traditional, hierarchical Chinese organizations, it also seems like managers' role is somewhat different than in Western countries. An example of this was given by Professor Guo, who mentioned that Chinese managers' role is more about status, and not about doing actual work tasks. The manager's role as the one who makes the decisions was also mentioned in the interview with the representative from the usability experts, who said that it is often difficult to reach a decision in a meeting if the managers are not present.

Another of the features of Chinese organizations, hierarchy, has already been mentioned. Several interviewees discussed the hierarchy in traditional Chinese organizations and mentioned the differences between Chinese and Western companies. It was argued that at least the larger Chinese enterprises are very hierarchical. A smaller Chinese company such as Company 4 does not, on the other hand, give this impression. Some of the companies, the Chinese Company 1 and American Company 2, claimed that their organizations were flat, but it seems like this concerns the organization as a whole and the relations between companies, rather than within the companies. For example, communication in these companies is done via managers and not directly between teams, which seems like a more hierarchical way of handling communication. Company 2, however, seems less formal and with a more open communication, probably because of the American culture influences.

One very special feature of the Chinese business culture is the meaning of guanxi. As companies' success is based on guanxi, they are very keen on maintaining it. In order to get new customers and keep the old ones, the quality of the products is not the most important factor. As we found out during our research, if Chinese people do business together, they do everything to maintain it. That means even accepting less high quality in products.

Guanxi can also affect how work is carried out. The interviewee from the usability experts said that many times they had to use their personal networks to approach any potential test users. Personal contacts were used to get access to the environments that they wanted to study, for example. The kind of relations that they have to the customer organizations affects if they are involved in the whole process or only do certain tasks, and they are able to use their long-term relations to some companies to persuade these companies that it is s good idea to involve usability experts in more parts of the development work.

### 7.2.3 Conclusions about conditions for usability work

We have noticed several difficulties in applying user-centered methods in China. Although the usability experts company claims that the same methods can be used in China as in the Western countries, our results, which are based partly on this interview, indicate that there are things to consider when introducing usability methods. For example, we have discussed the

hierarchy and the problems concerning feedback. One possible explanation for this difference in views could be that things concerning one's own culture are often taken for granted and perceived as natural. That Chinese users in general do not want to criticize is perhaps something that a Chinese usability expert has become used to. A foreign usability expert trying to apply the same methods in China would probably compare with working with users from his/her own culture and notice a frustrating difference. An interesting question is if the usability experts also have found ways to deal with this, which could explain why it is not perceived to be such a big problem. Finding an answer to this question would, however, have required observations of how the usability experts actually work in China. It should also be remembered that the users involved in the usability experts' focus groups and testing were often family and friends, and it is probably easier for them to speak freely since the involved persons already know each other.

The culturally rooted problems that we have discussed do not, however, mean that the methods for user-centered software development, developed in Western countries, could not be useful in non-Western countries. Since the needs of users vary not only according to tasks and physical or mental capability, but also according to the cultural context they are living in, we mean that studies of the users' characteristics are even more important when developing software products for other countries. Developing usable systems for Chinese users requires understanding both the surrounding culture and the specific needs of specific users. The idea is therefore not that user-centered principles should be replaced, but that if user-centered methods are to be used in non-Western countries, they might need to be extended or adapted in order to suit the target culture.

## 7.3 Improvements in usability work in China

Since almost all of the organizations in our study have reached the UMM-HCS level A and some of them also reached level B, a clear acknowledgement of usability issues is identified. Just as well as these organizations acknowledge the benefits of usability work they could also improve their work processes for better quality of products.

Today, more business organizations in China are beginning to invest in their own usability teams. There are also a few Chinese companies that offer professional usability consulting. Since China is still quite immature in the area of usability work, this might be the way to start this kind of improvements. One of our hypotheses suggested that the international organizations might be more aware of usability matters than the local ones, and these companies probably also carry some responsibility for spreading the knowledge of usability to local organizations. International organizations applying user-centered methods in other parts of the world probably bring some of their methods when they establish new sites in China.

Other ways for knowledge of usability to reach China include people who have been working abroad, such as for example the founder of the usability experts company, who bring UCD ideas with them when they return. Today, plenty of information about UCD and how to do usability work is also available on the Internet and other global media. Since UCD methods were invented in the Western countries some decades ago and these methods have been tried and developed for many years, there are already available methods that the Chinese organizations could use. This could make introducing UCD easier in China, since there is less

need for developing new methods and trying out new solutions. As we have argued, there is, on the other hand, a risk that these methods would not suit the Chinese culture, and therefore perhaps could not be fully implemented. We therefore argue that the methods should not be accepted uncritically, but that Chinese organizations still need to spend some time on finding out which methods can be used directly, which methods should be adapted to a Chinese context, and which methods perhaps should not be used at all.

In order to improve an aspect one needs to study the current level of that aspect. An interesting question concerns how product development was carried out before the increased awareness in usability and UCD. Maybe the organizations already implemented the methods for UCD without calling it the same as we do? Somehow the requirements must have been defined, and design and testing must have been done. According to our research, people responsible for these activities are still often managers and marketing people who mostly rely on market analysis and product experts' views. It seems likely that the methods used have not been what we would consider to be user-centered, so although a certain focus on the market and customers' needs is identified, there is much room for improvements.

In order to get the full benefits of user-centered design and development, the company needs to integrate the methods in all stages of the development work. As we stated earlier, the improvements are usually done in small steps, and a company will not move from a low level of usability work to a level where user-centered methods are integrated in all projects and parts of the work.

The 12 principles of UCD that were introduced in chapter three illustrate the aspects that an organization needs to fulfill in order to reach the higher level of usability maturity. However, since the organizations in China are on the UMM-HCS levels A and B, a lot of improvements need to be done before the higher levels are reached. The next step is to implement the most important methods for UCD. In order to reach the next usability maturity level, organizations need to actively involve end users in the development process and perform tasks and tests with them. Each part of the process should be improved by feedback from the users. The methodology should therefore support the end user involvement in all stages of the development cycle. There should also be access to suitable facilities and tools for usability work, and training in these matters should be offered to the whole staff. At this point these organizations should be fully aware of the fact that in order to make usable products the focus has to be on the users, not on the technology.

As previously discussed, no process fits all organizations, and the same goes for making improvements. Therefore, the details, exact methods and activities for UCD must be chosen depending on the needs and the capability of each organization. We need to, however, try to generalize these conclusions.

### 7.3.1 Management and responsibility

We have earlier discussed that introducing usability work is done in three phases, where usability work is promoted, implemented, and institutionalized. In the promotion phase, the focus is on building awareness and finding motivators for change. The motivators for introducing UCD already seem to be present in China, for example in the form of increasing

competition and demands for better products, and this will probably play an even greater role in the future if Chinese organizations are to compete on the global market. Most of the organizations that we have studied seem to have reached the implementation phase, where managerial issues and influencing managers to gain support for usability work is the most important.

To implement UCD in organizations with hierarchical structures, such as the majority of the organizations in China, one needs to work from the top and downwards. As stated earlier, usability methods should emphasize rules, procedures, strict documentation and control in order to be implemented in hierarchical organizations. Management support is always important for usability work to be successful, but in order to implement usability principles in hierarchical organizations it is absolutely essential that the changes are supported by the top management. This approach requires that the managers also have to be educated in these matters. An excellent way of making the managers aware of the usability matters is to let them join UCD activities, such as usability testing with real end users, and witness the benefits with their own eyes. It is not, however, beneficial to try to get the managers to act as a test group, since according to the hierarchical structure of Chinese organization the superior is not allowed, by any means, to lose face in front of other co-workers.

Even if the usability work is supported by the managers, there has to be a person(s) who is responsible for the actual implementation of the usability methods in to the organization. The person(s) responsible for a company's usability work should be someone with high integrity and 'status' among the other employees, and needs to possess enough authority to make sure that these methods are implemented in all the stages of development cycle. As we have argued, in order to gain status among engineers the person needs to be technically educated him-/herself. The problem in hierarchical, technology focused companies is that people who represent the 'soft' values are not considered as seriously as people with the same kind of background as the developers, and employees with psychology or design background probably do not reach the top management positions.

Due to potential problems with getting feedback, the person responsible for usability matters should also have a comforting and trustworthy appearance. Since Chinese users do not want to express their opinions too strongly, the person should give the impression of being comfortable to interact with. The usability champion needs to be able to collect all kinds of comments, even negative, from people involved in the process without making them feeling anxious about losing their jobs. It is also important that this person is experienced in sharing his/her knowledge and educate other employees in these subjects.

### 7.3.2 Education, communication, interaction

Organizations in China usually employ people with backgrounds in psychology and design to become responsible for the usability work. We consider these subjects greatly significant, but as we have discussed, we believe that the usability work will have greater chances to succeed in China if the people responsible for usability issues have some technology skills. As Mr. Zhu from Company 5 mentioned, developers often think that the usability matters are great in theory, but that it requires too much effort in order to work in practice.

As we stated in earlier chapters, the desirable knowledge basis for usability experts is interdisciplinary, with proficiencies in technical sciences, design, and psychology. In Western countries people working with usability often have a psychology or design background. In China, however, we believe that it is currently more significant for the companies to employ engineers with some psychology and design knowledge, than psychologists with technological know-how.

The problem is that the people with backgrounds in 'soft' subjects are not expected or assumed to really understand what it takes to develop IT products, leaving developers ignoring the usability matters. Based on statements from the usability experts, the development teams would take these issues into consideration much more easily if they were suggested by a person with the same kind of background and who therefore possessed authority among engineers.

This in turn requires changes in the software education in China. Higher education institutions in technical subjects should start paying attention to these aspects when deciding about the course subjects. Technical schools should include courses in HCI, UCD and other human factors subjects in their course programmes. The students in the engineering schools should be introduced to these subjects, not only to widen their views of engineering aspects, but also to make these matters more acceptable among technical staff. Making major changes in universities course programmes is of course not easy and companies have few possibilities to influence these matters. However, some pressure from the industry could probably also generate fresh directions in the academic world. If universities find that the industry needs people with this kind of knowledge, they are likely to be more interested in giving HCI courses.

Companies should also invest in internal educations concerning the benefits and methods for improved usability work. Educating internally does not only save money in terms of not needing to hire expensive consultants, but also keeping the skills and knowledge inside the organization. Even if we find it significant for an organization to have a usability expert(s) who is (are) responsible for the implementation, it is still crucial that the overall awareness of these matters among all the employees is achieved.

One reason for investing in an own team of usability experts concerns knowledge transfer. If internal employees do the usability work instead of consultants, the information that is collected about users in the beginning of a project can be used in a better way. If consultants are hired to for example conduct user studies and define requirements, they gather a lot of valuable information about the users' characteristics, tasks and environment. This information is of course partly documented in requirements lists and other kinds of written documents, but it will never be possible to transfer all of the information in this way. If internal employees instead handle these tasks, the knowledge that they possess about the users remains accessible within the company. This knowledge might be needed later in the development, for example if questions come up during the design phase, and then the questions can be discussed with the company's usability experts.

Of course, some companies might not feel that they are able to invest in their own usability teams. As we have discussed, consultants should, if they are involved, participate in the whole

process. This is not always the case today, but the usability experts firm is normally asked to join the developers when things 'go wrong', and is seen as some external force to make things right. What many of the organizations do not understand is that in order to avoid these problems, they should have had the experts included during the whole development cycle. This would not only improve the quality of the final product, but also save money since expensive last minute design changes could have been avoided.

Many organizations have human factor teams, but unfortunately communication and co-operation with development teams and other teams involved in the process is quite limited. Interaction between these teams should be improved. The teams should at least be split and mixed so that some of the engineers join the human factor activities, and the development team gets to include at least one human factor expert. Doing so, the team becomes more interdisciplinary and communication as well as knowledge flow is increased. There is, however, a risk for inconvenience in hierarchical Chinese organizations where information is preferred to be passed through managers. It is likely that many of the managers could view this as a threat to their position, and such changes should be introduced carefully. Especially in the beginning it will probably be important to make sure that managers still are kept informed of the communication and what is going on, and to convince them that this is not done in order to change their position in the hierarchy. One way could be to give managers new 'high-status' responsibilities, in order to lessen the risk that they will perceive this change as a loss of face.

Obviously the preferred situation would be to have employees with interdisciplinary backgrounds in development teams, but since Chinese organizations do not include people with different background in their teams, one solution is then to try to merge people from the human factor teams, who normally do not participate in the development phases.

### 7.3.3 Focus on the end users

Besides educating employees in the significance of changing the focus from technology to the users' needs and capabilities, the organization also needs to involve the end users into their development processes. In order to focus on the end users, the organizations need to make strict rules for this. The organization should organize and promote meetings between all the developers and customers, as well as the end users in the cases when they are clearly identified. If only some people meet the customers/users, there is a risk for large data leakage. If the developers also observe the context in which the system will be used, it is less complicated to relate to the real usability problems and more inspirational to create better products.

We mentioned earlier that in the Western countries, one of the problems with usability work was that usability was often taken for granted and would not be addressed unless customers explicitly asked for it. Since knowledge of UCD in China is less widespread, compared to the Western countries, Chinese customers are less likely to demand more focus on usability. Companies which have understood the value of UCD may therefore have to inform and persuade their customers of the benefits.

The companies should therefore also be better at highlighting the benefits of usability work to

their clients. Obviously the customers are not expecting bad design, but it could be worth explaining that in order to truly find the users' needs, and be able to develop a system that gives the maximum effectiveness in the clients' work, the involvement and feedback from the customer organization is needed. This also could mean that the development team has to 'bother' the users during the different phases of development cycle, but the benefits are worth it. In China, business is based on guanxi. Since relations are based on mutual trust it could be effective to let the development team meet the users in persona, so that the end users would gain trust toward the team. This trust will be needed when performing usability testing.

The importance of guanxi also means that many of the companies probably already have well developed contacts with their customers. This trust between the companies and their clients could probably make it more acceptable for customer organizations that the company visits the work place and observes the work being done there. It could also make customers more likely to listen to suggestions from the companies, such as if the company wants to implement user-centered methods. As was argued earlier, it is possible that in this rather hierarchical environment some arguments used in Scandinavia might not work well, for example arguments based on workers' rights to participate and the right to a good work environment. Instead, benefits for the customer company needs to be emphasized. Some of these arguments for UCD were discussed in chapter three.

Some problems with user involvement are expected in Chinese, hierarchical organizations. Even if users are involved, the actual benefit of that may not be as expected. Chinese users are not encouraged to speak their minds, meaning that gathering information might be a bit difficult. Even if they would do that, it is possible that their opinions might not influence the final decisions, since the managers' opinions might be considered more important. This is also a motivation for educating managers in usability matters, so that the top management, who often interacts with customer organization's top management, supports and encourages the users to express their opinions. The outcome could be increased awareness among the customer organization, leaving the end users more secure of their positions as informative and constructive critics toward the new product.

## 7.3.4 Choice of methods

Which methods should be used to carry out usability work? The usability experts in China speak for methods that result in measurable data. A lot of tests are based on scientific methods such as studies of eye movements, although more qualitative methods such as think aloud protocols and interviews are also used. All these methods are used in the Western countries as well, but since the Chinese organizations seem to require quantifiable proofs of the benefits, the methods chosen should preferably result in some kind of scientific measurable data. This we base on the fact that different type of certificates such as CMM and ISO9000 are popular among the Chinese organizations.

Prototypes are important tools for user testing and for presenting different ideas during the development phases. Although principles for UCD strongly recommend the use of prototypes, especially lo-fi versions such as paper sketches, these are rarely used within Chinese organizations, at least not for user communication. Although we agree that the ideal would be to use paper sketches and to use these for discussing and iterating designs together with users,

it is possible that paper prototypes might not be viewed as 'serious' enough since these organizations are quite technology focused. To start with, it could be a good idea to implement computer based, simple prototypes. This also contributes to making prototyping more of an engineering activity than an artistic activity.

Since the usability testing phase usually creates various questions about the user's capability to understand the system being tested, the test situations should be very well planned. It is normally preferred that the usability test engineer do not inform in too much detail what is being tested, so that the test person does not try to give the 'right' answers, but in Chinese culture it is probably preferred to emphasize to the test group that the object being investigated is not their intelligence or work competence but the functionality and usability of the system. In terms to get some interesting data it should be underlined that speaking one's minds does not result in losing jobs. If the test is arranged in a working environment is best to have one-to-one discussions with the test participant, since giving criticism in groups is particularly unwanted. Direct testing is not the only suitable method for collecting data, however. Sometimes it can be useful to observe the end users, with or without their knowledge.

## 7.4 Afterthoughts

As we have discussed earlier, a distinguishing factor in the Chinese software market is that it develops very fast. At the moment, China is experiencing fast growth in market opportunities, production, and R&D. The characteristics of the Chinese market, for example that the market is relatively new, could perhaps partly explain why the importance of 'getting there first' is often considered to be more important than 'doing things right'. However, since the development of the software market is so fast and the market is demanding more sophisticated solutions from the vendors, the companies are also realizing that the quality of the products is increasingly an important factor. The lack of knowledge, however, still hinders the view of usability as one of the most important quality factors. In comparison, in the Western countries the concept of usability and the user-centered methods have evolved for a longer time.

On the other hand, China is developing in such a pace, and the Western knowledge and life style is spreading among the younger generation. Many traditional features may lose their importance and new ways of thinking and acting may interfere with the old culturally rooted habits. These changes in society also affect the way people work. Many interviewees also witnessed the more Western attitude at work. These changes might lead to better conditions for improving usability work.

An interesting 'contradiction' between what could be expected and what we have observed concerns the ability to take a holistic view on system development. According to studies about thought processes, for example concerning how people from different cultures categorize and relate objects, Chinese people focus on contexts and see things in relation to one another, whereas Western people tend to focus on the individual objects. We still, however, hold that Western people in general are more experienced in having a holistic view of systems and system design. Our experiences show that in China, people involved in development work tend to focus more on detailed tasks, and less on the 'big picture'. One possible explanation for this could be the educational system where educations tend to focus only on technical

issues. The relational logic supports the UCD approach and this should make user-centered methods easier to introduce; however, at the moment the overly focus on technology, time-to-market, lack of resources, and lack of support from the management weight more in decision making.

During our research, we found that the overall interest toward SESUN, our research and usability matters was high. Many organizations were enthusiastic about participating in interviews, although some intended interviewees got strict orders from their managers to decline. We were interested in contacting the software companies' customers to find out what their attitudes toward the vendors were, but the customers rejected our request. This rejection left us wondering whether development people would be any more welcomed to perform usability studies in these customer organizations. Maybe the customer organizations strongly disagree if and when user-centered design activities are proposed? Then again, the software companies also refused to give us names or contact information to their customers.

Professor Hofstede's theories were widely used in this study in order to gain an understanding of how Chinese people function compared to Scandinavian and the North Americans (USA). We also had conversations with a Swedish PhD in sociology, who added some valuable insights so that we could build our view of the Chinese culture and society. Even though we lived in Shanghai for a period of six months and interacted with a lot of Chinese and Western people working there, there are obviously many things we do not see or do not understand about the fantastic host nation of ours. Other than that, we find Hofstede's theories suitable for making comparisons such as those we have made, but it is important to acknowledge that China, as any country, is not one culture, but many, and that it is constantly changing due to the many opportunities the political environment, growing economy, and access to media are offering.

We believe that a good way to continue the research in the future could be to continue developing methods for usability work and user-centered design and development in China. We believe that more Chinese research within this area would be valuable. On the other hand, it is obvious that the researchers in China do not have to create all the principles from scratch, but adapt some existing theories developed in the Western countries. It is always beneficial to let people with a lot of knowledge about the local habits and gestures, values, rituals, heroes, and symbols, develop the methods that suit the target group. We hope that our research has highlighted new approaches for developing better, suitable methods in China.

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# Appendices

## A. The five CMM levels

| | |
|---|---|
| **Level 1: Initial** | At this level, processes are defined as ad hoc and sometimes even chaotic. The processes are unpredictable if even defined, and success of the project depends on the effort of individuals. |
| **Level 2: Repeatable** | Basic project management processes are established in order to track schedule, functionality and cost. The organization can repeat earlier successes on projects of similar type. |
| **Level 3: Defined** | The organization has defined, standardized and documented processes for management and engineering activities. These activities are integrated into the organization's standard process, which is used in all projects. |
| **Level 4: Managed** | Quantitative goals are specified for process and product quality, and measures of the quality are collected. The data is used to evaluate and control the process and products. |
| **Level 5: Optimized** | The whole organization prioritizes continuous process improvement. Quantitative feedback from the process and from piloting innovative ideas is used in order to achieve this process improvement. |

(Source: Paulk et al, 1993)

## B. The five UMM-HCS levels

| Level A | Recognized |
| --- | --- |
| **Problem recognition attribute** | • The organization recognizes the need of improving usability.<br>• Managers and staff are aware of the benefits of producing usable products. |
| **Performed processes attribute** | • Information about users is collected.<br>• Information about users is used to improve requirements. |
| **Level B** | **Considered** |
| **Quality in use awareness attribute** | • Staffs are aware that usability is a particular attribute of a system, and that it can be improved.<br>• Staff is aware that usability is achieved through the use of human-centered development and support processes.<br>• Staff is aware that human-centeredness covers the total system, not only the interface. |
| **User focus attribute** | • Staff is aware that end users should be considered during the development.<br>• Staff is aware that the users' skills, background and motivation may differ from developers' or system support staffs'. |
| **Level C** | **Implemented** |
| **User involvement attribute** | • Active involvement of users in the development process.<br>• Tasks are performed with end users.<br>• Continuous testing with users.<br>• Processes are improved by feedback from users. |

| | |
|---|---|
| **Human factors technology attribute** | • Methods that support the involvement of users in all stages of the development lifecycle are used.<br>• Provides suitable facilities and tools for testing quality. |
| **Human factors skills attribute** | • Identify required competencies and plan how to use these for multi-disciplinary design solutions.<br>• Training of appropriate skills.<br>• Involve skilled staff in every stage of development. |
| **Level D** | **Integrated** |
| **Integration attribute** | • Integration of usability with the quality system.<br>• Facilitate the interface between usability people and the organization. Ensure communication between these departments.<br>• Use of appropriate representations. The user requirements should be represented so that the system developers and programmers understand them. |
| **Improvement attribute** | • Ensure design feedback and that evaluations take place at all stages.<br>• The development process encourages design changes based on user feedback.<br>• Ensure that the user feedback is taken into consideration at appropriate times during the lifecycle. |
| **Iteration attribute** | • Iterative design using prototypes.<br>• Use the information effectively. |
| **Level E** | **Institutionalized** |
| **User-centered leadership attribute** | • Manage usability program on all projects in an organization.<br>• Systematic improvement of usability.<br>• Human-centered attitude toward the organization's own processes and systems. |

| | |
|---|---|
| **Organizational human-centeredness attribute** | • Organizational implementations of human-centered practices.<br>• Acceptance of human-centered skills. |

(Source: Earthy, 1998)

# C. Interview questions: companies

**COMPANY INFORMATION**

- Tell us about your position in the company, your background and previous work tasks.
- Tell us about the department where you work. What do you do, and what is your department's role in the development process? How many persons work there? What kind of background do they have?
- Tell us about your products. Are the products custom made or standard solutions?

**CUSTOMER INFORMATION**

- Who are your customers? Chinese? International? If you have international customers:
  - Is there any difference between working with Chinese and foreign customers? If so, in what way?
  - Is there any difference in products if you design for the Chinese market versus for the international market?

**COMPANY CULTURE**

- Describe the organizational structure of the company.
- How would you describe the hierarchy of the company?
- What are the relationships between managers and other people in design teams like?
- Describe the business strategy and orientation.
- Do you think the Chinese values affect the company culture? In what ways?
- Do you have both Chinese and non-Chinese employees?

**PRODUCT LIFE CYCLE**

- Describe your product life cycle. How long is a 'normal' product development time?
- Describe the development process that is used. Do you use a specific process or model for software development? Is the process developed by the company or do you use some commercial process? Is it the same process used worldwide?
- Who is involved in the development team? When you decide who to include in a development team, what skills are you looking for?

**USER-CENTERED DESIGN WORK**

- Is there one person in the team who is responsible for handling contacts with customers/users?

- Do users actively participate in the development process in any way? If yes:
  - Who are involved?
  - Why are they involved, in which phases, how often?
  - What are the benefits and/or problems of involving users, in your experience?
- What do you usually do at requirements stage?
  - How do you identify users' requirements/needs?
  - Who from the customer organization takes part in defining the requirements?
  - Do you gather information about users' characteristics/tasks/work environment in the beginning of a project, and if so, what methods do you use? (For example market analysis, meet and talk to users/customers) If yes, how do you use that information?
- How do you test if the product meets the users' requirements?
  - Do you test the design with users? If so, who takes part in testing? (from customer organization)
  - What methods do you use?
  - At which stages of the process is this done and what are the objectives? (In the end of the process to evaluate, early in the process to test design ideas or gather information about requirements, during the design phase to improve design…)
- Do you receive feedback from the users at every stage of the development process?
- Within the company, do you discuss issues such as usability, HCI, or user-centered design? If yes:
  - Is this something that the whole staff should be aware of or is it the responsibility of a certain group/person?
  - Do you use a specific model for usability work?
- In a project, is there anyone (person or group) who is responsible for usability/HCI issues? If yes:
  - Are they used in all the teams and projects? Are they involved in the whole development process and all phases?
  - Do you have a special department for usability designers? If so, what are their tasks/responsibilities, and how does the communication between the other departments work?
- How do you think your Chinese customers would feel about the methods used in user-centered development (for example developers from your company interviewing their employees and studying how the work is done there) – or how do they feel, if the company already does this? How do you think the Chinese users in general feel about the usability methods?
- Have you noticed any problems with using "traditional" usability methods (focus groups, evaluating prototypes, etc.) in China?

# D. Interview questions: usability experts

**COMPANY INFORMATION**

- Tell us about your position in the company, your background and previous work tasks.
- Tell us about the services offered by the company.
- Which of the company's services is the most requested? Do customers often ask for several services, for example both requirement analysis and design, or is it more common to for example only do the requirement analysis?
- Employees: the number of employees, and what kind of background do they have?

**CUSTOMER INFORMATION**

- Who are your customers? Chinese? International? If you have international customers: Is there any difference between working with Chinese and foreign customers? If so, in what way is it different?
- How well established is usability design in China? Who are your competitors? Differences compared to competitors (services offered, skills, size, market share)?

**USER-CENTERED DESIGN WORK**

- How do you select or get in contact with users?
- User studies:
  - Describe (briefly) how user studies are done.
  - How do you get information about users and tasks? What methods do you use? Requirement analysis: what methods do you typically use?
  - Are foreign users ever involved or is it only Chinese? If foreign users are involved, do you think there are any differences between working with Chinese and foreign users?
- Interface design: are you often asked to develop the design for new products, or is it more common to do redesign when companies feel that there is a problem with the current design?
- Tell us about the usability lab and how it is used for evaluations/usability testing. Do you do evaluations both with and without users? What methods do you typically use?
- Have you noticed any problems with using "traditional" usability methods (focus groups, evaluating prototypes, observe users while they work, etc.) in China? If so, how do you solve those problems?
- In your experience, which methods do you find most useful (give better information, best suited for Chinese users) and why?
- How do you think the Chinese users in general feel about the usability methods?

- Do you think that Chinese companies in general understand the value of usability and user studies? If you for example want to visit the customer organization and talk to users, do customers in general see the value of this? Does it ever happen that customers tell you for example that they don't want it? Do you ever have problems with getting access to users etc.?