

# Lessons from Intercultural Project Management for the Intercultural HCI Design Process

Yvonne Schoper<sup>1</sup> and Rüdiger Heimgärtner<sup>2</sup>

<sup>1</sup> University of Applied Sciences Mannheim, 68163 Mannheim, Germany

<sup>2</sup> Intercultural User Interface Consulting (IUIIC), Lindenstraße 9, 93152 Undorf, Germany  
y.schoper@hs-mannheim.de, ruediger.heimgaertner@iuiic.de

**Abstract.** Global competition requires that new technical products are launched at the same time in all relevant global markets. Therefore the Human Computer Interface (HCI) product designers need to know all requirements of all global customer groups before starting the global development process of user interfaces (UI), which takes normally place in dispersed intercultural mixed UI designer teams. Therefore the user-centered design process from ISO 9241-210 is analyzed concerning the requirements of intercultural management and particularly of intercultural project management. On this basis, an agile intercultural HCI design management process is developed. The resulting UI design approach empowered by cultural aspects makes sure that new systems are designed right from the beginning for the cultural diverse user markets in a time and cost efficient and effective way.

**Keywords:** User-Centered Design, ISO 9241-210, Agile Methods, Agile Project Management, Culture, HCI, Model, Approach, Process, Structure, Intercultural, Intercultural Project Management, Intercultural User Interface Design, Management Process.

## 1 Introduction

In times where new technical products like cars, mobile phones or digital cameras are launched at the same time in the global markets of America, Europe, Asia and Arabia, the product engineers must today consider from the very beginning of the product development process that there is not just one single user or user group for the future product. In comparison to earlier times when a technical product was first developed for one homogeneous target group (in most cases for the home market) and then adopted to other markets by simply translating the relevant user interfaces into the language of the export country, it is of critical importance for a successful new product today to know the requirements of all global customer groups first before starting the global development process. The usability of technical devices controlled by a user interface (UI) which were developed in the cultural context of the designer (e.g. mid Europe) for another culture (e.g. East Asia or India) is hardly possible as usability mainly depends on the application in the cultural context (age, sex, language, education, knowledge, experience, religion, self-conception, dealing with power) and environmental factors (such as politics, wealth, income, infrastructure) (cf. [1], [2], [3]). In this paper, the Human Computer Interface (HCI) Design Process defined in ISO 9241-210 is analyzed

in section 3 concerning the requirements of culturally different target groups demonstrated using a practical example presented in the next section. In section 4, an agile intercultural HCI design management process is proposed to cope with the problems caused by applying the standard HCI design process in the cultural context.

## 2 Case Study: Navigation System

Today, GPS based navigation systems can be found as a standard option in nearly all cars, as stand-alone equipment and as software for Personal Computers, PDA's and smart phones. The users of these navigation systems are all car drivers all over the world, as fast and safe navigation is a requirement of all user groups. From the perspective of the navigation system designer one could imagine that the only difference between the different national customer groups is the language they speak and the map they use. Therefore, by translating the software into the different user languages and adapting the maps to the individual countries it should be possible to offer localized navigation systems to all relevant user groups worldwide. For example, from the European perception a navigation system should contain the features such as display in North/ South direction, display in driving direction, perspective of display in 2D or 3D, order of input data (e.g. in USA: Country, City, Zip Code, House Number, Street vs. in Germany: City, Street, House Number) as well as input via keyboard or via voice input. But the intercultural reality looks different: Let us take a look at the following real case examples from Japan, Nicaragua and the Arabian world. Following Motohiko Takayanagi, General Manager at Pioneer, the market leader for navigation systems in Japan, most streets in Tokyo have no name. The block of houses, the streets and the houses are indicated by numbers. In addition the house numbers are counted in the sequence of their construction in the district. Therefore the driver needs precise landmarks for orientation such as "leave the 20 floor high grey building on the right and the four floor high brown hall on your left". For better orientation the navigation system offers the Japanese driver two perspectives in 2D and in 3D at the same time on the same display (cf. Figure 1, source: URL=<http://www.technewsdaily.com/5764-gps-navigation-displays-front-windshield.html>, last access 3/15/13). As many streets and highways in the big cities in Japan (and also in China) are built over one another the other, the navigation systems in the cars have a height measuring sensor, which lets the driver know exactly where his current position is and which next street to go to. Figure 2 shows the height measuring function.



**Fig. 1.** 2D and 3D screenshot from Japanese navigation system display in windshield



**Fig. 2.** Height measuring sensors show the driver his position exactly, picture by: Alpine

In addition the Japanese customer expects that the navigation system acts as a planning guideline: it calculates current traffic congestion and calls the driver on his mobile phone to suggest that he should take off earlier than normal. But the Japanese drivers expect even more: with the menu "Date Planer" for example the system is supposed to find the most romantic route nearby and an appropriate restaurant with the telephone number for reservation and even includes recommendations for pleasant sightseeing. Now we sail over the Pacific Ocean to the capital of Nicaragua, Managua. In Managua there are no addresses at all. Only a few big axis, some through streets and ring roads have names or at least designations such as "Highway to Granada", "Diagonal of the Martyrs" or "Course of the Municipality". A typical turn-by-turn direction would be: „drive from the Hotel 'Princess' one street to the south, and then twenty five meters down on the left hand side". The system is based on points of interest (landmarks), if they still exist: "there, where the old cinema Cabrera was". "Up" and „down“ do not mean upwards or downwards with respect to a hill, but to the orbit of the sun, therefore East and West, and West means "down", where the cemeteries are. Finally, we go to the Arabian world: for Islamic people it is of high importance to have a Mecca compass in their navigation system in order to know at any time in which direction the user must look and pray at the five praying times per day. Particularly for Islamic people on road this is a very important feature today. Therefore all application designers offer Mecca compasses for all types of smart phones. Figure 3 shows one Mecca compass example.



**Fig. 3.** Mecca Compass for iPhone Navigation system (source: URL=<http://appfinder.lisisoft.com/ipad-iphone-apps/mecca-compass.html>, last access 03/15/13)

These three examples show that a deep detailed cultural knowledge of the specific user habits is necessary for a designer of a navigation system in order to develop a new system that fits all customer requirements and can therefore be sold and implemented in different countries. But as the three examples show, it is impossible that one UI designer has all this specific information from all relevant user groups worldwide. He will, however, have a profound knowledge of the circumstances in his own cultural environment in order to be sensitive for relevant aspects in other cultures (cf. [4]). This is the basis for intercultural mixed UI designer teams (cf. [5]).

### 3 Analysis of the User-Centered Design Process

Today only few complete methodologies exist that are able to support UI designers while developing user interfaces in a systematic, structured and guided way in order

to create better systems faster. Among these methods there is no systematic approach so far which embeds intercultural UI design. Therefore the standard HCI development process ISO 9241-210 will be analyzed concerning its ability to integrate intercultural management aspects (cf. [6]). Figure 4 shows an overview of the user-centered UI process. The ISO 9241-210 User-Centered Design Process (UCDP) consists of six steps which will be analyzed in the following chapters concerning their ability to integrate intercultural management aspects. First the weaknesses in every process are examined and recommendations for implementing an intercultural UCD process are then defined.

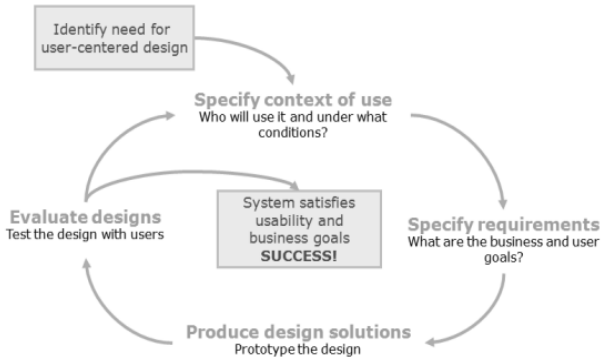


Fig. 4. User-Centered Design Process following ISO 9241-210

### 3.1 Identify the Need for User-Centered Design

It is the aim of this first process step to realize the necessity for the attractiveness and the market success of a new product, regardless of whether it is a technical device, an electronic product or new software, that it takes the user into the focus of the new design being developed. The analysis of the current ISO 9241-210 UCDP concerning the aspects of intercultural management and particularly intercultural project management shows that these aspects are missing in the UCD process, especially in the important early project phase. The following weaknesses in the current process can be stated thusly: There is no focus on a well-managed project start by an experienced project leader. A product development team of a worldwide successful future product should consist of representatives from the most important market. The first task of a UI design (UID) development team should be to acquire a deep understanding of the complexity of the task and its requirements. Therefore the authors recommend implementing the following intercultural project management elements in this first process step of an intercultural user-centered design process: Build a diverse team with representatives from all relevant user groups e.g. Japan, China, India, Latin America, North America, Arabia, Sub-Saharan Africa and Europe. Such a cross-cultural team has the potential to be far more effective and innovative than a mono-cultural one if it is managed well. Furthermore, to become a high performance team the team needs an experienced team leader who knows the different team development process phases and is able to

moderate the team through them. Analyse the current market situation concerning existing products, main competitors, environmental factors like politics, new legislation, economic trends, sociologic and technological developments worldwide (i.e. doing the so called “PEST” analysis – Political, Economic, Social and Technological analysis which describes a framework of macro-environmental factors used in strategic management) as well as existing user groups worldwide and the new user groups.

### 3.2 Specify Context of Use

The usability of a system strongly depends on how the user can cope with the system (cf. [7]). This knowledge can be obtained, for example by observing and asking the user during his interactions with the system (cf. [8] and [9]). In this case the user articulates his desires and hence his needs regarding the usability of the system. Unfortunately, this method is applied far too little in industrial HCI design even today. This is critical because, if that knowledge is missing in the final product, it will not be wanted by the user. The user cannot apply it appropriately because important features are missing or it takes too long to do a certain task because of bad design caused by lacking or wrong user requirements. The analysis of the UCDP concerning the aspects of intercultural management and intercultural project management shows that these aspects are missing in the standard UCD process concerning the context of use in the cultural context because there is not sufficient focus on the profound analysis of the cultural aspects and their influences represented by HCI dimensions, UI characteristics, intercultural variables and cultural dimensions. HCI dimensions describe the style of human machine interaction expressed by information frequency and density and order as well as interaction frequency and speed. User interface characteristics capture the most relevant attributes of user interfaces containing metaphors, presentation, navigation, interaction and mental models ([10]). Intercultural variables cover the localization levels function, interaction and presentation ([11]). Direct intercultural variables concern HCI directly such as color, icons, language and layout as well as interaction speed and frequency. Indirect intercultural variables embrace HCI margins such as service manual or packaging. Cultural dimensions serve to describe the behavior and values of members of certain cultures like uncertainty avoidance, individualism or collectivism or power distance ([12]). [13] defined cultural dimensions that are related to human interaction such as universalism, neutrality, specificness, seriality and control. They can be related to HMI dimensions to establish a link between the cultural imprint of users to their HCI style ([14]). Hence, to specify the individual cultural context of use in the relevant usage situations it is important to develop a profound understanding of the individual culture specific needs of the users (as mentioned in the examples at the beginning of the article), to use methods to gather the deep understanding of the user requirements that are quantitative and even more the qualitative market research techniques, to consider international requirement clusters, e.g. in the case of navigation systems it could be that business managers word-wide have similar requirements to implement functions like receiving Emails, getting a regular news updates, whereas taxi drivers, in comparison need a precise forecast of the traffic congestions, to practice detailed observation of the users on-site in their

typical usage behavior situations (following the principles of the method “design thinking”: for instance, when, where, how, how long, does the user enter data in the navigation system?) as well as to describe on this analytical basis the HCI dimensions, UI characteristics, intercultural variables and cultural dimensions for the context of use.

### **3.3 Specify Requirements**

The objective of this process step is to collect all needs, interests, expectations and behaviors patterns of the different user groups. In international context, it is important to determine that there is not one homogeneous user group but that there are thousands or even millions of individual users worldwide as in the case of a consumer product like a mobile phone. To better handle the complexity of this fact these users can be condensed to fictitious user groups, so-called “Personas”. The fictitious, specific and concrete representation of target users help the product teams to better understand the users and thus to improve their products (cf. [15] and [16]). The intercultural UID process requires not one, but several personas that represent the culturally different user groups. The analysis of the standard UIDP in ISO 9241-210 shows that the current process does not fulfill these demands completely. If these requirements are not completely understood at the very beginning of the UIDP, there is the risk that it will not be possible to develop one single general platform that can then be localized to the cultural specific requirements. The specification of all the different requirements from all the stakeholder groups necessitates that all requirements from the previous process steps identification and specification of the requirements are collected regardless of their origin, the requirements are compared with the strategic goals of the company and those requirements that do not fit the corporate strategy are deleted, all conflicts of interests between the requirements are worked out (e.g. small display vs. large display, touch screen vs. keyboard), all conflicts of interests are solved, the remaining requirements are the product targets of the project and the targets are checked for following the SMART principle: specific, measurable, attainable, realistic and timely. It is important to note that they should not describe the solution of the existing problem as targets are supposed to be free of solution.

### **3.4 Produce Design Solution**

In this process step the culturally diverse UI design team has the task to generate new innovative design solutions. Research shows that the more diverse the team members are concerning their age, sex, cultural background and education, the larger the chance for innovative new ideas (cf. [17] and [18]). Hence, the following topics are to be considered in intercultural UID teams: Intercultural product design team processes are much more complex to manage than mono-cultural teams. Problems during the planning of time and budget, managing the project, escalation of problems, conflict management, risk management or a different understanding of quality in the design phase will occur daily (cf. [19] and [20]). Because of the different cultural imprint and underlying assumptions of the team members, processes such as team development will take longer than in mono-cultural teams. Communication is a challenge in diverse

teams: misunderstandings caused by talking the same language which is, however, not the mother tongue for most of the team members will happen frequently and can lead to anger and frustration. All these potential problems require an inter-culturally experienced professional team leader to cope with and manage these potential obstacles in a professional way.

### 3.5 Evaluate Design

The better and more precise the product targets are defined at the beginning of the development project, the easier it is to compare them with the current state of design. These target performance comparisons are to be carried out continuously to make sure that the resulting design solutions correspond to the objectives defined. In intercultural context, it is important to evaluate the design status from the perspectives of the different cultural user groups defined to ensure that the design fits to the different and sometimes even contradictory requirements of all stakeholders.

### 3.6 System Satisfies Usability and Business Goals

The continuous control mechanism of (i) testing the current design by all relevant cultural lead target group testers that know the environmental factors and local user requirements and conditions in detail and (ii) reworking the design on the basis of this feedback is the basis to fulfill the diverse requirements and objectives of all cultural target groups with the new product. In the case of severe conflicts of interests which cannot be solved in one product solution, but where the fulfillment of the requirements is of highest priority for the market success of the product (e.g. incompatible legal prescriptions for the display size of navigations systems) and where it is not possible to reconcile these requirements, another option must be found. In the worst case the requirements cannot be fulfilled by one user interface design and the management must specify how to proceed. Introducing agile methods in the UIDP can help to speed up this process of entangling the manifold and fast changing interests from stakeholders from different cultures.

## 4 Proposal of an Agile Intercultural HCI Design Process

As most user-centered design projects are IT or software projects and agile methods are already used in international development projects (cf. [21]), the authors suggest applying the methods of *agile project management* in intercultural user interface design projects. Agile Project Management (APM) is a project management method which was developed in the software industry (cf. [22]). It is an iterative method in engineering and information technology development projects to create innovative new products by using fast feedback-loops. By quickly producing rough prototypes and giving them to the customer it is the aim of the method to receive their fast direct feedback and to continuously optimize the product on the basis of the customer/user feedback (cf. [23]). The most dominant effect of this project development approach is that the team can be more effective in responding to change. In addition they can

dramatically reduce the time between making a decision and seeing the consequences of that decision (cf. [24]). These benefits fit exactly to the demands of innovative intercultural user interface design (IUID) projects that require fast feedback loops. In addition, international product development teams are spread all over the world. Agile methods are a way to best use the alleged disadvantage of the time difference. By dividing the design work e.g. into the programming of the software (which could be carried out e.g. in Eastern Europe) and into the testing of the software (which could be done e.g. in Mexico or California by using the time difference of 7 to 9 hours), the software programmer could receive a feedback to his daily programming work over night and optimize it on the next day on the basis of the evaluation. This procedure can lead to a reduction of the development times by 50%. Moreover, the designers would receive feedback from software testers that derive from different cultures than the programmers and therefore know the specific requirement of the customers in their individual markets. Finally, with such a globally dispersed development process it can be ensured that the key relevant customer/user requirements are continuously controlled. Figure 5 shows the concept of the overall intercultural HCI design management process by using the methodology of Agile Project Management (APM).

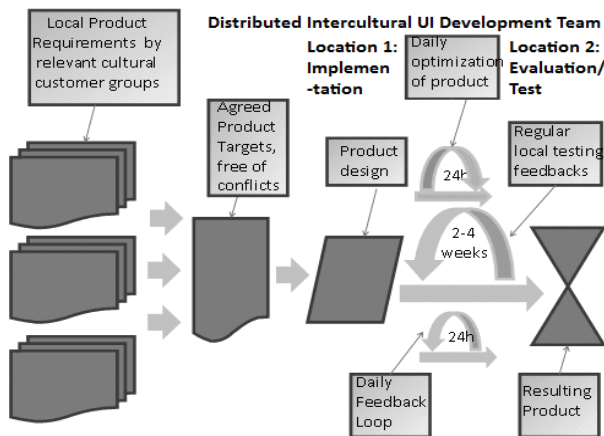


Fig. 5. Agile Intercultural HCI Design Management Process

This agile intercultural HCI design management process represents a new approach by combining the best practices of the current HCI design process with the elements of intercultural management. Living this process, the UI designers better accommodate the diverse global user requirements and respond faster to change. In addition, the approach reduces the development time dramatically by fast feedback loops.

## 5 Summary

In earlier times technical consumer electronic products with a user interface were first developed for the designers' home market and then exported to other countries by



translating the user interface into other languages. The users realized quickly that the product does not fit their user needs and do not buy it. An alternative would be to develop country-specific products that correspond to the user requirements of the specific target user group. But that would mean that a company must develop several different product user interface designs to correspond to the cultural requirements of the most important key markets worldwide. Furthermore, with this procedure companies are not successful any more in this fast changing globalized world. Therefore, along internationalization additional procedures are needed to reconcile the partly contradictory requirements from the culturally different user groups in one user interface which fits all relevant user cultures. On the basis of the existing HCI development process defined in ISO 9241-210 an agile intercultural HCI design management process combining the best practices of the current HCI design process with the elements of intercultural management has been suggested. Thereby, the resulting user interface design method complemented by cultural aspects ensures that new systems can be designed right from the beginning for one or more cultures while designers better accommodate the diverse global user requirements and respond faster to change. In addition, the approach reduces the development time dramatically by fast feedback. The next step is to apply the proposed intercultural modifications to the user-centered design process in several practical intercultural user-centered design projects in order to prove the suggested lean process to be successful.

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