

# Cultural Difference and Mobile Phone Interface Design: Icon Recognition According to Level of Abstraction

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## ABSTRACT

Mobile phone market has widened to a global scale and consequently mobile phones are distributed throughout the world. This tells that the user interface in mobile phones inevitably confronts cultural difference as much as other products and consequently the user interface suited to each cultural trait is required. To clarify the relation between cultural traits and mobile phone interface, UI elements which would be influenced by cultural traits in interaction between user and mobile phone were extracted and hypotheses related to the UI elements were proposed. For a pilot study, 20 subjects (10 subjects each from America and Korea) participated in the icon recognition test. The test parameters were task completion time, recognition rate, preference. The results show that Korean subjects performed significantly better in the set of concrete icons while American counterparts showed quite the opposite tendencies. No significant differences in preference according to icon style were found. The results suggest a possibility of cultural impact on icon recognition according to the level of abstraction.

## Categories and Subject Descriptors

H.5.2 [Information Interface and Presentation]: User Interfaces  
– *Graphic user interface, User-centered design*

## General Terms

Design

## Keywords

Mobile phone interface, Cultural difference, Icon recognition.

## 1. INTRODUCTION

Interest in the influence of culture on user interface design has been growing as the world market is globalized. However, products and services have been localized at the superficial level through checking text, number, date/time format, images, symbol

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*MobileHCI '05*, September 19–22, 2005, Salzburg, Austria.  
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and functionalities without reflecting any unconscious cultural effects [6]. Culture is the collective programming of the mind which distinguishes a group of people from others [3]. It means that people from different cultures are different in their perceptions, cognition, thinking styles, and values. Thus, it is important to thoroughly understand different cultural traits in designing interfaces for international users. However, previous researches related to cultural viewpoint have been mainly focused on web sites and publications. There is no research on relation between culture and mobile products, even though mobile product has been already prevalent in our day to day lives. In case of mobile phone representing mobile products, estimated 423million mobile phones were sold globally in the year 2002. Mobile phone development is becoming software-focused and user interface had totally different characteristics from desktop PC. Nokia reports that Eastern cultures display different consumer preferences from Western ones [1].

Therefore, the objective of this study is to investigate the ways cultural differences might affect mobile phone performance of users with different cultural background, and to develop ways to design appropriate interfaces to accommodate cultural difference.

## 2. THEORETICAL FOUNDATION

### 2.1 Cultural Difference between Easterners and Westerners

In the area of anthropology, many cultural variables have been suggested to distinguish and categorize different cultures based on various cultural models by anthropologists like Hofstede. Well-known cultural variables include individualism/collectivism, uncertainty avoidance, masculinity/femininity, power distance, high context/low context, polychrone/monochrone, and universalism/particularism [4]. Such cultural variables are known to be helpful to understand cultural difference and Eastern cultures and Western cultures show opposite traits to each other according to the variables. Eastern cultures have authoritative and hierarchical systems and collective tendency. And they attach great importance to human relationship and try to avoid uncertainties. On the other hand, Western cultures have opposite propensities.

Cognitive psychologists have also studied on difference in cognitive style between Easterners and Westerners. Westerners have tendency to think in analytic, abstract, imaginative and

linear ways. On the other hand, thinking style of Easterners is synthetic, concrete, relying on periphery and parallel [6].

## 2.2 Impact of Culture on User Interface Design

Interaction between users and system contains four phases in terms of user’s cognitive activity. Users firstly perceive any affordance the system offers and check applicability. And then, users perform tasks with expectation and finally confirm whether the task they performed is completed or not. In the process, cultural impact increases as the phases proceed [2].

## 3. RESEARCH MODEL

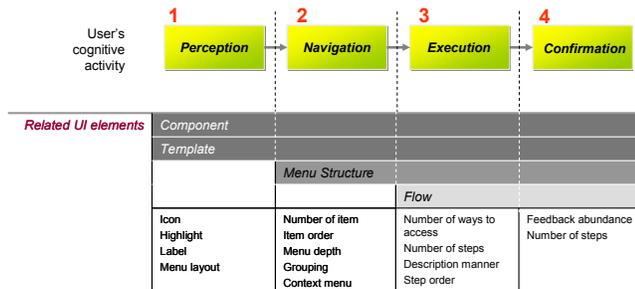


Figure 1. Related UI elements in each interaction phase

In the same manner, interaction between mobile phone interface and users consists of four phases: Perception, Navigation, Execution, and Confirmation. Related UI elements (or issues) in each phase are shown in Figure 1. Users first face components and template and then, experience menu structure to search a specific menu or items. When users reach a menu to perform a task, users start to follow a certain path to achieve an ultimate goal like sending text messages (SMS) or downloading contents. After performing tasks, users check if the task is completed as users intended.

## 4. HYPOTHESIS

Correlation between the UI elements and some cultural variables was considered to speculate UI elements which would be influenced by cultural difference as shown in Figure 2. Five UI elements/issues which were expected to have relatively close correlations with cultural difference were hypothesized. The elements include ‘Icon style’, ‘Highlight’, ‘Feedback abundance’, ‘Menu structure (depth)’ and ‘Description manner’.

In this study, ‘Icon style’ issue was pilot-tested as an initial study. The hypotheses related to ‘Icon style’ are as follows.

Hypothesis 1. Familiar and Concrete icons would perform better than new and abstract icons.

Hypothesis 2. Easterners and Westerners would have some differences in recognizing icons and intended referents of function.

Hypothesis 3. Easterners would perform better with the concrete icons than Westerners.

Hypothesis 4. Westerners would perform better with the abstract icons than Easterners.

Hypothesis 5. Subject groups would have some differences in preferring icons.

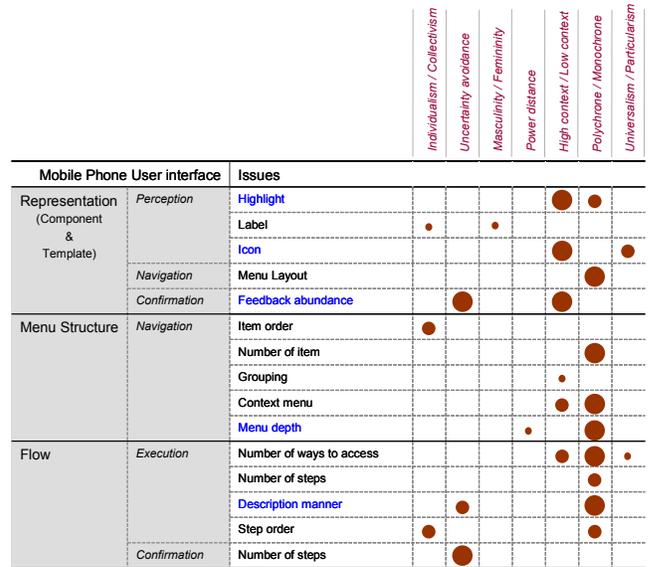


Figure 2. Correlation between UI elements and cultural variables

## 5. METHODOLOGY

### 5.1 Subjects

For comparative experiment between Eastern culture and Western culture, Korea and America were chosen as representative nation of each culture. According to Hofstede’s Index [3], practically accessible Korea and America which was proved to be the most different from Korea in terms of cultural traits were selected. 20 subjects (10 each from Korea and America) participated in this test.

### 5.2 Materials

Menu icons which are used in current mobile phones in Korea and America were gathered and classified depending on their metaphor and how well they represent the icon referents. The icons were grouped into three types: abstract, semi-concrete and concrete. It was noticed that various kinds of icons are used to represent the same referent. Especially icons representing five referents (Call log, Message, Downloads, Voice Recording and Web) were ranged from abstract icons to concrete ones. Therefore the five referents and three different icons in each referent were selected (Figure 3). Most icons were obtained from currently existing icons as they are in terms of their shape and concept and one icon (‘Web’ icon in the concrete group) were designed and added in. The icons were changed into simple line drawing versions to adjust the level of complexity and quality of images.

REFERENTS	ABSTRACT SET 1	SEMI SET 2	CONCRETE SET 3
1. Call Log			
2. Message			
3. Downloads			
4. Voice Recording			
5. Web			

Figure 3. The three sets of mobile phone menu icons

### 5.3 Procedure

The test was in the form of web-based interactive questionnaires made with Macromedia Flash. 20 subjects participated in the test through the web. The questionnaires were provided in each country's native language and made up of two parts. Part one was followed by part two.

Firstly in the icon recognition test (part one), the five referents and a set of five icons were shown. The subjects had to match each referent with one symbol which they thought best represented the referent, for a total of three times for the three symbols sets as shown in Figure 4. The test parameters studied in this part were the following:

- Hits and misses rate (percentage of correct/incorrect identification)
- Task completion time (time taken in matching each set of icons)

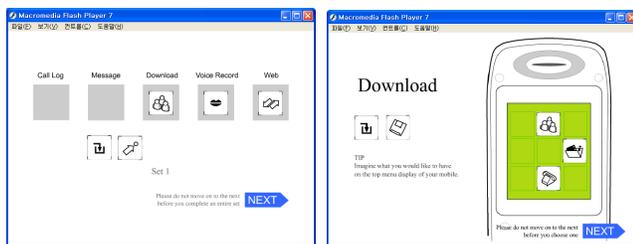


Figure 4. Software prototypes: part one (left) and two (right)

In the icon preference test (part two), three icons (one from each set) together with the referent they presented were shown. The subjects had to drag one symbol they preferred most and drop on proper position they want of display screen illustration as shown

in Figure 4. In all, the subjects would choose five symbols to represent the five referents and complete their final display screen with preferred icons. The test parameter in this part was:

- Preference (preferred icon style, percent distribution)

## 6. RESULTS AND DISCUSSION

### 6.1 Recognition rate

Between sets, the semi-concrete icons (set 2) had the most number of high (91%) recognition rate, followed by the concrete icons, and abstract icons last. Cultural comparison results are shown in Figure 5 and 6. Korean subjects scored relatively higher recognition rate than American subjects for the semi-concrete (set 2) and the concrete icons (set 3). American subjects recognized better than Korean subjects for the abstract icons (set 1). Between icons, abstract icons for the referents "Call Log", "Message" and "Web", recognition rates were generally significantly lower than semi-concrete and concrete icons. But for the referents "Downloads" and "Voice Record", subjects scored higher recognition rate for the abstract icons.

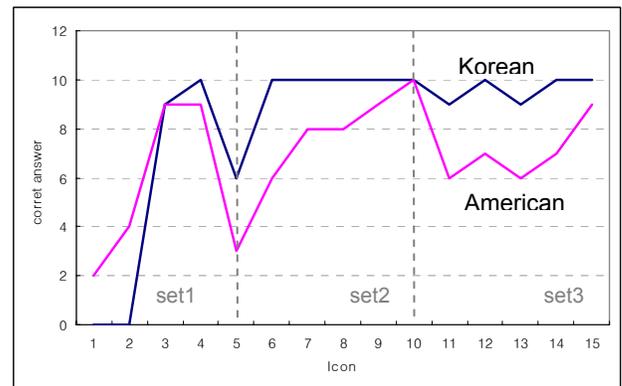


Figure 5. Recognition rate in each icon

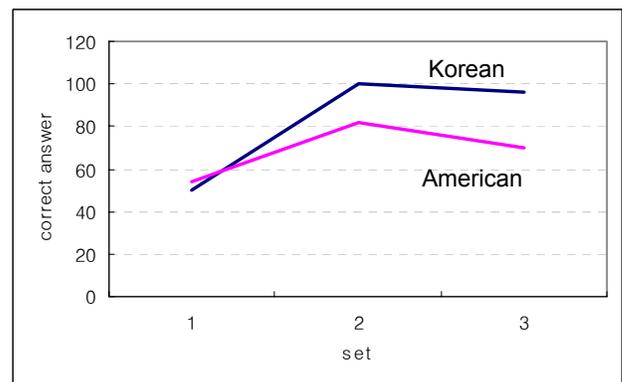


Figure 6. Recognition rate in each set

### 6.2 Task completion time

Between sets, the concrete icons took the least time, followed by the semi-concrete ones and the abstract icons took significantly more time as shown in Figure 7. Korean subjects performed

quicker than American for the semi-concrete and concrete icons and American performed quicker for the abstract icons.

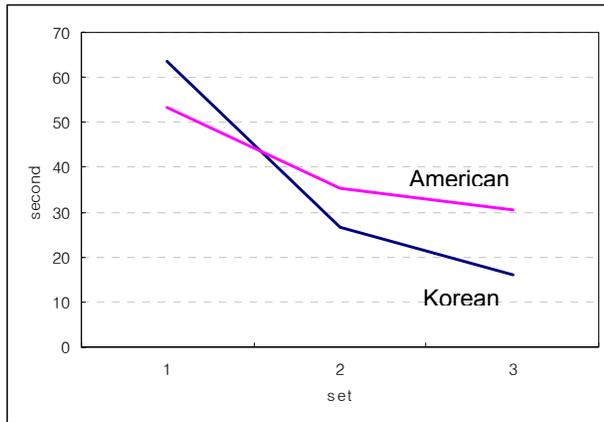


Figure 7. Task completion time in each set

### 6.3 Preference

Between set, subjects preferred the semi-concrete icons most (54%), followed by the abstract and the concrete ones. Both groups showed almost the same preference and preferred icons they recognized better. The following Figure 8 shows icons each group preferred for each referent.

REFERENTS	ABSTRACT SET 1	SEMI SET 2	CONCRETE SET 3	ABSTRACT SET 1	SEMI SET 2	CONCRETE SET 3
1. Call Log						
2. Message						
3. Downloads						
4. Voice Recording						
5. Web						

Figure 8. Icon preference of each group  
(Left – Korean, right- American)

The results indicated that for the Korean subjects show better performance with concrete presentation in terms of recognition rate and task completion time. A concrete representation provided a visualization aid in helping the Korean subjects, who were more

field dependent compared to the American subjects, to perform the recognition task better. On the other hand, the American subjects who had tendency to be more field-independent recognized the abstract icons better and faster than Korean subjects. Besides, the American way of thinking tends to be more imaginative and less dependent on the periphery compared to the Korean.

The original intention of making test material with flash was to research menu priority through getting information of icon position where the subjects put the selected icons on the display screen in part two. But it could not be done in this study due to failure on the process of transmitting the data.

Even though cultural tendency was slightly found, the difference was not significant enough to prove the hypotheses. Because the tests were conducted with only 20 subjects and some icons might not be classified properly. Besides, balance between icons in a set might be inappropriate.

### 7. CONCLUSIONS

Cultural difference was found to some extent in icon recognition according to the level of abstraction. The pilot tests suggest possibility of this research and can be an initial study for further researches clarifying relation between culture and mobile phone interface design. In this study, only icon style has been covered. But other issues such as 'Highlight', 'Feedback abundance', 'Menu structure' and 'Description manner' must be studied in depth as well. Furthermore, degree of cultural impact on each UI element can be compared. For instance, cultural impact on 'Description manner' at the execution level (phase 3) would be stronger than cultural impact on 'Icon style' at perception level (phase 1). Because cultural impact would increase as the phases proceed.

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