

Designing Globally Accepted Human Interfaces for Instant Messaging

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Abstract. This study investigated the perception differences of IM (instant messaging) icons between users of different cultural backgrounds. Two major parts were developed for this study. The first part investigated the frequent IM icons as a basis for improving the IM user-interface design. The second part tested the use of different graphical symbols using subjects from two different populations, Taiwan and the United States. From the result, there is significant difference between the two user groups on their recognition of those frequent icons. Confusion matrices further show that some icons were thought to be associated with same functions by the two groups while some others were linked with different functions. These similarities and differences could be due to the cultural differences between the two user groups. It is suggested that cultural differences should be effectively recognized by icon designers for globally accepted human computer interfaces in software products.

Keywords: Graphical User Interface, Globalization, Instant messaging, Icon.

1 Introduction

With the advent of the age of global information society, people's use of computers has become widespread throughout the world. The use of Internet in Taiwan is also becoming increasingly more extensive. According to a survey conducted by the Taiwan Network Information Center [15] the percentage of the Taiwanese population that use the Internet was 60.25% (13.8 million) at the end of December 2004, while about 53.78% (10.31 million) of residents in Taiwan age 12 and above have experience using broadband Internet. This number will rise as broadband Internet connections become even more prevalent in Taiwan.

Internet websites are often used internationally on a great variety of purposes. In a survey regarding top ten languages (i.e. English, Chinese, Japanese Spanish, German, French, Portuguese, Korean, Italian, and Russian) used in the web, Miniwats Group [12] pointed out that the number of recorded Internet users reached the staggering figure of 863,981,961 worldwide in 2006. With more than 37% of total Internet users, English is leading in absolute terms, while the other 541,381,124 users access the

Internet in a different language. Internet users of non-English speaking were predominant in 2006. However, the greatest percentage of Internet users is English language users.

Because a considerable share of Internet users are from non English-speaking countries, using the global language for design of human-centered communication interfaces, such as product labels, traffic signs, and computer icons are of significant importance [9]. Still, icons and images are more universally recognizable than text [11]; [18]. As a result, research is needed to explore designs of globally-accepted, human-centered interfaces.

Most common presentation modes for icons are pictorial and verbal [4]. A graphical user interface (GUI) is a human-computer interface (i.e., a way for humans to interact with computers) that uses windows, icons and menus and which can be manipulated by a mouse [14]. It has also been indicated that icons are the most essential component of GUIs [7]. Horton [8] described icons as the small pictorial symbols used on the computer menus, windows, and screens. Icons alone are meaningless without a particular context.

In the realm of human-computer interaction (HCI), icons have dominated, especially since GUIs became increasingly common. Icons are extensively used because it can be easily remembered and recognized [16]. Additionally, icons offer the perception of affordance, which can facilitate human-computer interaction in terms of ecological perception [6], [11]. Goonetilleke et al. [7] suggested that there are three important aspects to consider when designing and developing icons: ambiguity, uniqueness, and dominance. Huang et al. [9] found that qualified computer icons should incorporate the following design criteria: styling, message quality, meaningfulness, locatability, and metaphor.

In the previous research on issues influencing icon design, this can be problematic in the designing of icons for international users. Bourges-Waldegg and Scrivener [1] conducted a study to understand culturally determined usability problems. It assessed the usability of the Netscape browser and "the Nemeton" website. Results of the study pointed out that the differences between cultures are basically representational differences; that is, although cultural factors such as religion, government, language, art, marriage, and sense of humor are universal, the way they are represented is specific. The results also further confirmed that if users do not understand a representation, it is harder for them to learn the functions of a technology. It was suggested that users will favor the system they understand better regardless of the fact whether it is in their native language or not. In an information display study, Nakajima [13] found that different populations play an important role in their cognitive processing of information. Americans prefer "easy-to-process" information displays rather than displays that require an extended cognitive commitment. At the reflective end of the continuum, the Japanese generally take greater time, and display a deeper processing commitment. Studies concentrating on the relationship between usability and culture can be considered very important.

Choong and Salvendy [4] investigated the cultural differences in cognitive abilities between American and Chinese populations by conducting a practical icon recognition experiment. The study assessed the participants' icon recognition, pointing out that Chinese participants performed more efficiently with pictorial rather than alphanumeric modes. They also seemed comfortable with high context

information. A possible reason for this was thought to be their knowledge of the English language.

2 Globally Accepted IM Technology

The goal of globalizing IM applications is to create a core design for effective intercultural communication. The globalization process identifies the most common or shared features of the design of GUIs. The process thus identifies global functionality, interaction styles, communication patterns, and information that exceed cultural boundaries. The result of the globalization process is a product's core design. In computer user interfaces, functions such as open, close, save, and print are the most basic level functions. The above description becomes the global core. Thus, it would not seem sensible if the computer user interface designers ignore the global core.

Cultural differences exist in languages, orthography, symbols, number formats, and images. People from different cultures also vary in their appearance, perception, cognition, and style of thinking [4]. As progressively more cultural differences are found, increasingly more rules and guidelines have been developed, making the international design process more complicated at the same time. Additionally, such rules and guidelines make it hard to develop products that will fulfill the needs of many users. Consequently, international usage problems could arise if designers lack the motivation to gain understanding of the influence of cultural factors that may cause such problems.

Culture is a concept that is difficult to define and measure. The most striking cultural differences are noticed by us. However, it is difficult to talk about culture in a definitive way. Cultures change over time, so we often talk about traditional culture and contemporary culture. Particularly in the context of instant messaging, that is the phenomena of youth culture and other subcultures as formed by discussion and chat groups. Instant messaging, as a form of synchronously written communication, provides its users the ability to communicate with other people in real-time via the Internet [5]; [17].

International Data Corporation (IDC) predicted that corporate IM use was going to grow from 18.3 million in 2001 to 229 million users worldwide in 2005. Most IM users tend to be teenagers. IDC indicated that IM users would exceed 300 million users in 2005 [2]. Clearly, a growing number of people have used instant messaging, both for personal and business purposes. IM is also very popular with young people today. That is because IM is an easy way for them to keep in touch with friends. Besides, IM is much cheaper than the use of telephones. Youth can stay online to chat and not worry about the costs. As IM becomes widespread, further IM functions and icons are being extended and renewed. However, it is not yet fully established as to whether the existing functions and icons meet user's requirements, especially the design of the IM GUIs. It is, in actuality, imperative that GUIs are designed in a way that facilitates quick and accurate recognition by users, to ensure better usability for interfaces [4].

Although some of the aforementioned studies have shown that cultural diversity is important in HCI design, the issues have not been examined with respect to the use of IM software. Thus, this study will address the IM interface from a more global aspect.

In this study, the main emphasis falls on users' perception (recognition) on icons while using IM. Consequently, this paper attempts to evaluate possible differences between different cultural groups and to discern how those differences may affect user's perception on icon representations.

3 Method

The main purpose of this research was to investigate how cultural differences between different user groups may affect users' perception of icons when using IM. Based upon the previous discussion, three research questions were developed to guide the investigation.

RQ1: What are the most frequently used IM functions?

RQ2: Are there differences in the recognition of the functions referred to by the icons in IM software?

RQ3: What are the perception differences between users of different cultural backgrounds in their icon use with IM?

In order to resolve the above described research questions, two major parts were developed for this study. The first part investigated critical icons of IM user-interface design. The second part tested different graphical symbols using subjects from different populations from Taiwan and the United States.

3.1 Part 1: Frequent IM Function Investigation

This part was based on a survey of a large group of university students. The majority of them have some experience communicating using IM.

(1) Participants

A survey questionnaire was administrated to a random sample of students at a selected university in Taiwan. Data collection lasted a period of two weeks during April 15th to April 30th, 2006. Participation in this study was entirely voluntary. Five randomly selected classes of 163 Taiwanese students of a university participated in the study. The sample returned 148 usable and valid surveys (90.7%), with 129 undergraduate students (87.2%) and 19 graduate students (12.8%). The participants ranged in age from 20 to 29 years.

(2) Measures

This part sought to identify the frequent functions as a basis for part 2. The questionnaire consisted of two general sections: (1) IM function use frequency, (2) demographics and experience of IM use. A total of 29 items were developed and used in this survey. There were 20 questions representing 20 common functions in the first section. This section asked the frequency of use with each function in the IM activities. A five-point Likert scale was used, with "1" meaning "never use" and "5" meaning "frequent use". The second section asked the demographic characteristics which included 9 items concerning students' educational background, gender, and habits of using IM.

3.2 Part 2: Icon Perception

In this part, the study tested the difference in icon perception while using IM. The study examined the perception difference between two groups of participants from two countries.




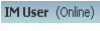



































(1) Participants

Participants selected from eastern and western cultural backgrounds are essential. The Taiwanese and American participants were considered to represent eastern and western cultures respectively. Eighteen Taiwanese and Eighteen American college students (total 36) participated in this experiment.

(2) Measures

The questionnaire was presented in the participant native language. The 11 functions (Table 2) as identified from the first part of the study (as will be explained in section 4.1) plus two additional functions, “to engage in voice chat” and “to use the webcam” were used in this part. These two functions, though not considered as frequent in use, were potentially of interest by the authors and were therefore added. For each function, three icons were selected from several common IM programs, resulting in a total of 39 icons as shown in Table 1. Icons were selected from IM software such as AOL Instant Messenger (AIM), ICQ, MSN Messenger (also known as Windows Messenger), Skype, and Yahoo! Messenger, which have attracted millions of daily users in recent years [3]. Each set of icons was based on selection from one major source in the above IM software. Each participant was asked to match each icon shown on a computer screen to a particular function from the 13 function lists.

Table 1. Icons utilized in the study [taken from AIM, ICQ, MSN, Skype, and Yahoo]

Num.	Item	Set 1	Set 2	Set 3
1	To engage in text messaging			
2	To change user handle			
3	To send files or photos			
4	To change user status (away)			
5	To change the display picture			
6	Add emoticons			
7	To multitalk with people			
8	To save the text messaging			
9	To send and receive email			
10	To change interface			
11	To change user status (invisible)			
12	To engage in voice chat			
13	To use the webcam			

4 Results

4.1 Frequent IM Functions

Statistical analyses were performed using SPSS 11.0. In terms of IM users' behaviors, the greatest percentage of respondents reported that they have been using IM more than four years (40.5%), followed by three to four years (25.7%), two to three years (25.0%), and one to two years (6.1 %). New users (less than one year experience) represented only 2.7%. Additionally, IM users believe MSN Messenger is the best IM software (89.2%) while most prefer MSN Messenger (98.6%). Most users spent an average of one to three hours chatting on a typical day (54.1%). They used IM at least once a day (62.8%). Most of them used IM between 10 pm to 12 am (57.4%). Additionally, 60.8% of respondents log onto IM from home. Based on the study of part 1, the functions with mean ratings of frequency of use over 3.0 were selected as the critical functions, shown as the 11 functions in Table 2.

Table 2. Frequent functions utilized in IM

Order	Function	Mean	Std.
1	To engage in text messaging	4.18	0.81
2	To change user handle	3.95	0.91
3	To send files or photos	3.92	0.77
4	To change user status (away)	3.83	0.93
5	To change the display picture	3.80	0.92
6	Add emoticons	3.72	1.05
7	To multi-talk with people	3.19	0.79
8	To save the text messaging	3.18	1.22
9	To send and receive email	3.11	1.19
10	To change interface	3.04	0.98
11	To change user status (invisible)	3.01	1.02

4.2 Icon Perception Differences

In order to address research questions two and three, there are several statistical analyses shown in this section, including descriptive statistics analysis, ANOVA test, and confusion matrices analysis.

There were 36 participants joined in the questionnaire survey which included 18 Taiwanese and 18 Americans. There were totally nine males (50%) and nine females (50%) in Taiwanese participants. In American participants, there were three males (16.7%) and fifteen females (83.3%) joined this survey. From descriptive statistics, 66.7% of Taiwanese used IM software over four years. However, there were only 38.9% of American participants used IM software over four years. Results also show that 94% of Taiwanese participants and 72% of American participants used MSN Messenger.

To assess the perception difference between the two groups of participants in their IM icon recognition, ANOVA was performed for the correct recognition rate against the participant group (Taiwan/U.S.), icon set (3 sets), and function (13 key functions).

The result indicated that there was significant difference between Taiwan and U.S. participants ($F_{1, 24}=6.69, P<0.05$). The icon set was significant ($F_{2, 24}=86.65, P<0.001$). The function was also significant ($F_{12, 24}=45.48, P<0.001$). The interaction between icon set and function was significant ($F_{24, 24}=9.93, P<0.001$). The interaction between icon set and participant group was significant ($F_{2, 24}=9.14, P<0.001$). Finally, the interaction between function and participant group was also significant ($F_{12, 24}=3.99, P<0.01$).

Table 3 shows the correct recognition rate of the Taiwan and U.S. participants with the three icon sets and the 13 functions. The ISO (International Standards Organization) 3864 [10] suggests a minimum correct recognition rate of 66.7% for icons. Based on this standard, 40 icons (51.3%) in the questionnaire survey were found lower than 66.7% and were thus difficult to recognize. To the Taiwanese participants, 18 (48.7%) icons had the low recognition rate. However, 22 (56.4%) icons were difficult to recognize for the American participants.

Table 3. Correct recognition (CR) rate for Taiwanese and U.S. participants

N.	Item	CR rate (Set 1)		CR rate (Set 2)		CR rate (Set 3)	
		(%)		(%)		(%)	
		Taiwan	US	Taiwan	US	Taiwan	US
1	To multitalk with people	61	56	89	100	33	44
2	To send and receive email	100	100	100	94	94	94
3	To change user status to <i>away</i>	100	83	67	39	44	39
4	To engage in text messaging	44	61	61	39	11	28
5	To change user handle	94	39	61	11	17	17
6	To engage in voice chat	100	83	100	78	89	72
7	To send files or photos	67	61	61	50	61	72
8	Add emoticons	94	94	100	94	78	83
9	To use the webcam	78	78	67	61	78	100
10	To change interface	78	61	39	33	6	17
11	To save the text messaging	33	39	56	56	6	6
12	To change user status to <i>invisible</i>	83	83	50	67	17	33
13	To change the display picture	94	83	39	22	39	44
	Average	78.9	70.8	68.5	57.2	44.1	49.9

In order to determine the relationship between culture differences with each icon design, this study also performed a confusion matrix analysis. As shown in Table 4, there are six matrices (3 sets×2 countries). Each matrix has 13 rows and 13 columns. Each row demonstrated a specific icon. The corresponding 13 functions were displayed as the 13 columns. In the questionnaire survey, the participant choose the most suitable function they regarded to match each icon. The number of correct matches (persons) was recorded on the diagonal. The incorrect choice was recorded off the diagonal.

From Table 4, one can observe that, for example, in set 1, Taiwanese participants tend to have more problems with the fourth icon “To engage in text messaging”, mismatching it with the eleventh function “To save the text messaging”. As a result, some of the notable confusion results were shown in Table 5.

The results of this research could have important implications for the globally accepted IM design of additional user-friendly icons.

There are three major results gathered from this study. First, 11 most frequently used functions in IM software were identified. These functions deserve more attention by IM interface designers to improve these key icons so that the IM software can be more user-friendly.

Second, the recognition rates between different participant groups of different cultures (the Taiwan and the U.S., in this study) in their IM use was discovered, despite the fact that many of the icons were selected from some of the most popular IM software. The result seemed to suggest that cultural background is of significant importance on how users think the icons may be. People from different cultures indeed vary in their appearance, perception, cognition, and style of thinking [4]. Shneiderman and Plaisant [14] also concluded that the graphical icon design may be strongly influenced by the designer's own experiences. If the designer does not consider the culture differences carefully, the usability of icons may be decreased due to the users from different cultural backgrounds. HCI designers should always bear the cultural background in mind when designing global products. More importantly, cultures can change over time. It would also be interesting to know whether the recognition eventually converges between different populations, as affected by product marketing, training, and globalization.

Finally, the icon perception similarities and differences between Taiwanese and American users can be observed from the confusion matrices analysis. The results suggest that among IM users in both countries, there were still many icons that could easily be confused by the users. From the confusion matrices and the results in Table 5, two icons turned out to be mis-matched into the same but wrong functions by both groups. This is interesting because the graphical representations behind these icons appear to be common between the two populations. There are differences too. Two icons each was matched into two different functions by each group. This indicates there are different thinking about the graphical representation of the icons between the two populations. Piamonte, Abeysekera, and Ohisson (2001) found that icon confusions are very important in design considerations and early stages of use. The confused symbols should be changed or redesigned if possible, or training should be offered and emphasized during the early stage of using the symbols. The confusion results presented in this study offer a possibility to further understand the cultural differences behind the graphical and symbol design of these IM icons for their future redesign.

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