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Chinese Users' Preference for Web Browser Icons

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Abstract: This paper compares the perspicacity, appropriateness and preference of web browser icons from leading software providers with those of a culture-specific design. The history and future direction of web browsers is outlined, together with the implications for the future growth of Chinese internet users. China, with its rapidly expanding young netizens has now overtaken the USA in terms of the number of internet users (253 million) and we predict it will reach saturation (≈70% internet penetration rate) by 2012. If correct, this will have a dramatic effect on the use of English as the 'Lingua Franca' of the Internet. This online study was conducted in Taiwan and involved 103 participants (mean age 21 years), who were given three sets of web browser icons to review, namely Microsoft Internet Explorer 7.0, Macintosh Safari 3.0, and culturally specific icons created using the Culture-Centred Design methodology. The findings of the study show that all three sets have generally high recognition rates, but that some icon functions (e.g. Go/Visit and Favourite) in all three sets have poor recognition rates and are considered inappropriate. Furthermore, some significant differences were found when we analysed the level of user experience amongst several icons.

Keywords: Web Browser Icons, Perspicacity, Chinese, Culturalisation, User Interface Design

Introduction

THE CULTURALLY DIVERSE civilisations of the 21st century rely upon symbols and icons to aid product acceptance and universality of design. The world marketplace and the pressure created by the global credit crunch have meant that manufacturers of products and systems have to a larger extent relied upon the global language of signs to streamline universal standardisation and improve the profit line.

Symbols and icons are also extensively applied to the interface of computer operating systems, but also to information appliances such as the ubiquitous iPod and all new mobile phones. Aside from benefiting from a more efficient way to communicate and socialize with others, iconic ambiguity and misinterpretation often occur due to cultural and linguistic differences. Universal Standardisation is the key solution, but this does require training and adaptation.

It is the author's belief that some culturally specific symbols and icons have had to be traded for Universal Standardisation, which in turn leads to the loss of local originality and cultural identity.

The History and Development of Internet Web Browsers

Web browsers, such as Netscape Navigator, Mozilla, Konqueror, Microsoft Internet Explorer and Apple's Safari, are well-known software applications. The first web browser was the generic WWW (later named Nexus) introduced in 1990 by Tim Berners-Lee (Wikipedia 2006). Since its inception, there have been at least 29 different web browser packages available, most of which have been free. The most popular of these have been Internet Explorer (85% market share worldwide) (c.1995) for the PC, and Safari (c.2003) for the Mac.

In terms of the Web metaphor there are aesthetic similarities between all web browsers, which indicate certain functions on the toolbar such as the Forward, Backward, Favourite, Go/Visit, Home, Refresh, Search, and Stop icons (see Figure 1).



Figure 1: Web Browser Icons from Microsoft IE 7.0

From the latest Macintosh OS X and Windows XP there appears to be a trend of integrating software and operating system into the evolution of the interface. The *Leopard* interface for the Apple Macintosh operating system and *Vista* interface for the Microsoft Windows XP operating system have some similarities, i.e. three dimensional icons which are smooth, translucent, colourful and big, which are customisable by desktop management and multimedia internet tools.

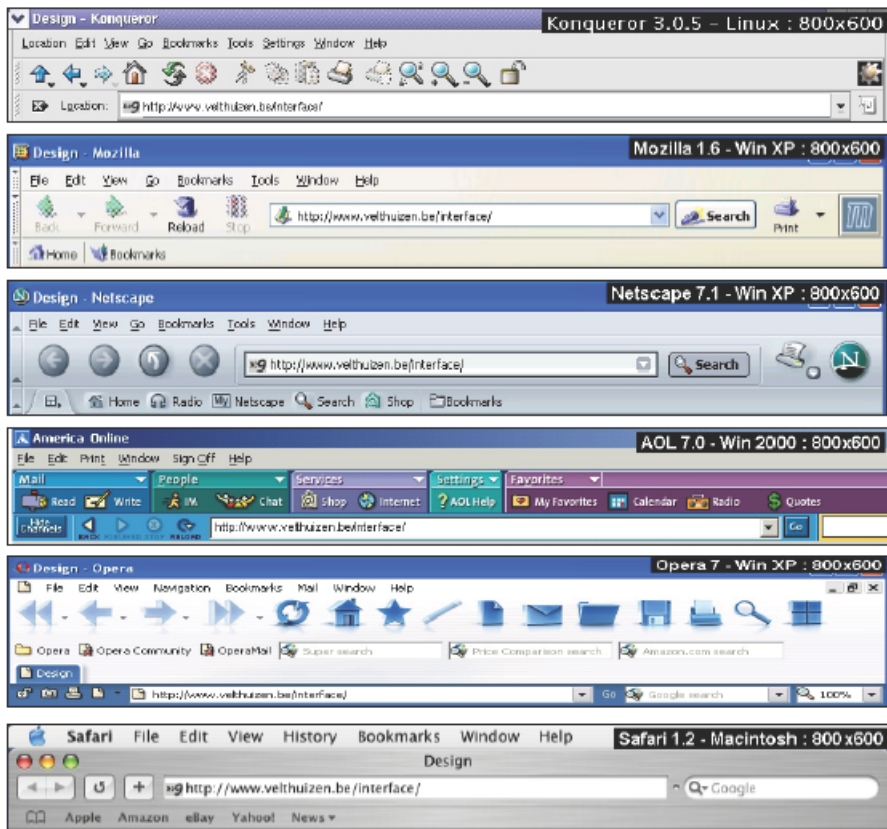


Figure 2: Competitor Web Browser Interfaces

Growth of the Chinese Market

The recently published 22nd statistical survey report – ‘Internet Development in China’ (July 2008), states that there are approximately 84.7 million computer hosts and 253 million Internet users in China. This only amounts to a penetration rate of 19.1% of the population (CNNIC 2008). Even with this low rate, China has now overtaken the USA (230 million) in terms of the number of Internet users. The number of Internet users in China has grown by 347% during the period (2000-2006) (Miniwatts 2008), and if as predicted, China continues to grow at a conservative estimate of 40% per annum (note that Chinese Internet users grew by 43 million in the first half of 2008), it will approach saturation ($\approx 70\%$ penetration) by 2012 (see Figure 3).

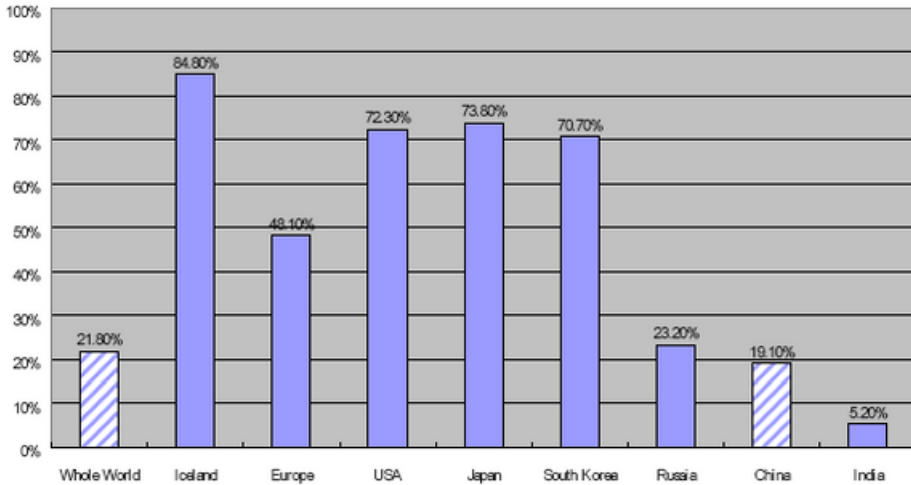


Figure 3: Internet Penetration Rates (Miniwatts 2008)

Demographics of Chinese Internet Users

The average weekly surfing time of Chinese internet users is currently 19 hrs, with the largest professional sector within the Chinese internet market being Students with 76 million users (30%). It is therefore no surprise that the 18-24 age group has the highest number of internet users. However, only 3.9% of people over 50 yrs use the internet, the biggest reason for not using the internet is stated as 'Not having the necessary skill' (43.3%). China clearly needs to reach out to this underutilized market.

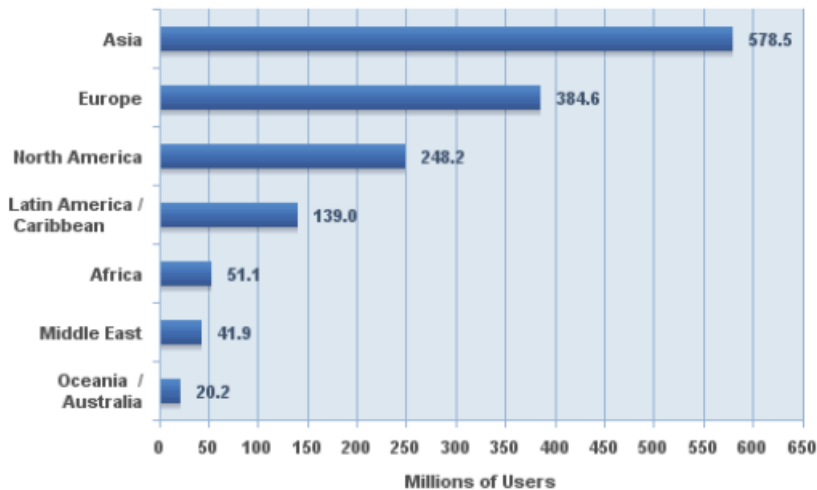


Figure 4: Internet users by world region (Miniwatts 2008)

Brandon has suggested that a majority of internet users primarily speak languages other than English (Brandon 2001); Sun has suggested that this could be as high as 70% (Sun 2001). It has also been reported that 75% of users in China and Korea prefer content in their own languages (Ferranti 1999). This mismatch highlights the need for more research and shows possible commercial potential.

What Makes a Good Web Browser Icon?

Over the years there have been many suggestions and design guidelines for what constitutes good usability, however few have focused on the subject of what would make a good web icon (Horton 1994; Fernandes 1995; Barr 2002).

According to Barr et al (2002), who used the semiotic approach to compare two sets of icons for the same functions within the Mozilla and IE web browsers:

“...most of the icons utilised by the two browsers are symbolic signs. This is likely because there is no dominant metaphor for the internet, and thus no real-world phenomenon to create iconic and indexical icon forms.”

Horton (1994) suggests the checklist for good icons should include: Understandable; Unambiguous; Informative; Distinct; Memorable; Coherent; Familiar; Legible; Few (less than 20 icons); Compact; Attractive; Extensible (Horton 1994). According to the International Standards Organisation (ISO) icon recognition rates should be at least 67% to achieve acceptability (Thatcher 2006).

Research Questions

- How well can Chinese users associate IE 7.0 and Safari 3.0 web browser icons with their intended functions?
- Do Chinese users think that these representations are appropriate?
- Is it possible to design a culturalised web browser for Chinese users?
- What form would these culturalised icons take?
- Will Chinese users prefer to use culturalised web browser icons over the traditional offerings from Microsoft Internet Explorer and Macintosh Safari?

Purpose of the Study

The purpose of this study was to investigate users' perspicacity, appropriateness and preference of web browser icons, and to compare the influence of gender, educational level and computer experience on these findings.

Methodology

This section details the selected web browser icons used in this study; it also describes the participants, together with the experimental design, and the methods of data analysis.

Selection of Web Browser Icons

The web browser icons chosen for this study were Internet Explorer 7.0 and Safari 3.0, since Microsoft and Macintosh are the most well-known international software platforms. We then compared these with Culture-Centred Design (CCD) (culturally specific) icons that aim to differentiate from standardised ones, and are designed for Chinese users (Shen 2006).

Eight basic icon functions were selected from each of the latest IE, Safari, and CCD web browsers, i.e. Forward, Backward, My Favourite, Go/Visit, Home, Refresh, Search, and Stop. The order of these when presented to participants was deliberately mixed up to prevent guessing by test subjects.

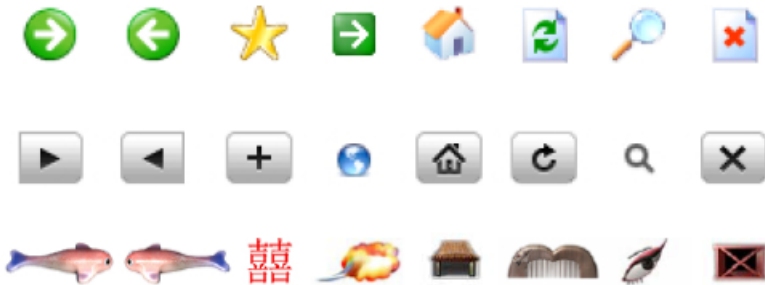


Figure 5: Selection of IE 7.0, Safari 3.0, and CCD Web Browser Icons

Participants

The experiment was conducted online in January 2008 at the College of Art and Humanities, National Formosa University. The duration of the experiment was approximately 10 minutes which included tests for iconic perspicacity, appropriateness, and preference. Participants had to complete each page in order to continue to the following experimental page. There were a total of 103 undergraduate students (52 male, 51 female) involved in this online experiment through a website hosted by the department. All of the participants major in Multimedia Design.

The online experiment was only open to students from the Department of Multimedia Design. The original target number of users was 100 with an even gender ratio. During the testing period, online data was checked daily, and once the number reached our target figure the website was closed.

Experimental Design

Participants were firstly required to fill in some background information which included age, gender, educational background, level of computer experience, and their regular computer platform type (PC or Mac). They then completed six experimental trials (two with each of the three selected web browsers in terms of iconic perspicacity and appropriateness). A screen with one button labeled “Next” at the bottom of the page appeared before each trial. Participants needed to complete the questions of each page in order to activate the “Next” button and continue to the next trial. Once they entered into a new page, they could not go back and change their answers. In a post-trial questionnaire, participants rated their preference in

terms of the three types of icons in terms of each function. There was no time limit for the trials, however, in the majority of cases the experimental session lasted approximately 10 minutes per subject.

Methods of Data Analysis

There were four categories as independent variables: (a) gender: *males vs. females*; (b) educational background: *high school vs. college vs. university vs. graduate school*; (c) level of computer experience: *<2 yrs vs. 3-4 yrs vs. 5-6 yrs vs. 7-8 yrs vs. >9 yrs*; and (d) the participants' regular computer platform: *PC vs. Mac*. These four categories were tested independently to evaluate overall usability. The dependent variables were the usability measured by icon perspicacity, icon appropriateness, and icon user preference. A one-way ANOVA showed a significant difference of the participants' user experience. Other relevant knowledge of the participants was shown by the use of the mean and standard deviation for qualitative analysis of icon perspicacity, appropriateness, and preference.

Results and Discussion

This section presents a general analysis of the user participants together with statistical analyses of the experimental data divided into three major sections as follows: icon perspicacity, icon appropriateness and the user preference of web browser icons. The dataset consisted of almost 4,000 data points.

General Analysis of the User Participants

The study consisted of 103 participants; 52 males with a mean age of 20.73 yrs ($SD = 2.79$); 51 females with a mean age of 21.35 yrs ($SD = 3.32$).

98 % of the user participants (male and female) regularly used a PC, rather than a Mac.

In terms of the level of computer experience, females had a higher level of experience (37% >9 years) than their male counterparts (23% >9 years). In addition, females had no subjects with less than 2 years experience, whereas males had (6% <2 years).

With regards to their educational background, females had a higher percentage of University students and Graduate students, whilst 10% of the males had high school or vocational college backgrounds.

Analysis of User Perspicacity – Test 1

In general, most users could identify the correct icon with its intended function, the success rates ranged from 67% to 100% for IE; 50% to 98% for Safari; and 47% to 96% for CCD.

Considering that 98% of the participants were IE users, it is somewhat surprising that the success rates for some of the IE icons were not higher.

If we take the ISO minimum threshold of success as 67%, then it can be stated that IE has a problem with its Go/Visit icon, Safari has a problem with its Favourite and Go/Visit icons and CCD has a problem with its Go/Visit and Refresh icons.

Gender Analysis

Since all users had problems with the Go/Visit icon perspicacity, i.e. IE (*mean = 68%*), Safari (*mean = 54%*), and CCD (*mean = 49%*).

Users were confused by the intended meaning of this function and had trouble with its metaphoric association. Users thought that the IE Go/Visit icon related to Forward or Search; that the Safari Go/Visit icon related to Favourite, Search or Refresh; and that the CCD Go/Visit icon related to Refresh, Favourite or Search.

Level of Education Analysis

As stated previously, there were a small number (5%) of participants whose educational background related to either High School or College, all of these were Male.

In general, most users could identify the correct icon with its intended function, the success rate ranged from 50% to 100% for IE; 40% to 100% for Safari; and 33% to 100% for CCD.

Overall, the College students performed best followed closely by the University students and then the Graduate students. The High School students performed worst of all, getting large percentages of incorrect answers across the three web browsers.

Again the Go/Visit icon caused major problems for the participants as can be seen from the IE graph above, where 67% of the College students thought that this meant Search; they were joined in this assumption by 11% of the University students and 10% of the Graduate students. Also, 18% of the Graduate students and 15% of the University students thought that this meant Forward.

User Experience Analysis

In terms of the number of years of computer experience of the participants, the success rate ranged from 33% to 100% for all browser types. With the exception of the (<2 years) experience level, all the experience levels had high success rates, in the region of 80% to 100%. There was a marked cut-off in the success rate below 3 years, with success rates in this region averaging only about 33%. However, it should be stated that there were only three participants in this category, so the results could be inconclusive.

Once again the Go/Visit icon proved most difficult for the participants to associate with the intended meaning. Interestingly, with the IE icon this had the unintended effect of differentiating between the experience level groups, with an increasing success rate being closely associated with the level of experience.

For both the Safari and CCD Go/Visit icons, again the participants had problems, however, with these it appears that with the exception of the (<2 year) experience level, a little experience provided the user with better recognition skills than a lot of experience.

Analysis of User Icon Appropriateness – Test 2

In terms of icon appropriateness, females tended to be both less critical (lower levels of highly inappropriate/inappropriate) than males and more approving (higher levels of appropriate/highly appropriate) than their male counterparts. Within gender analysis, both females and males were in favour of the IE icons, compared to Safari and CCD ones. However, only

6% of males and 0% of females regarded the IE icons as highly appropriate. In terms of educational background, most College and University participants tended to feel that all three types of icons were either neutral or inappropriate, in contrast to the High school and Graduate school ones who seemed to show more strong views on highly inappropriateness and highly appropriateness. With regard to user experience, it is likely that the rate of icon appropriateness is related to the participants' educational level.

Gender Analysis

As regards to the design of the IE Go/Visit icon, most females (43%) and males (33%) felt neutral. For Safari's icon, most females (33%) and males (37%) thought it was inappropriate. Even though most females (45%) and males (48%) thought that the CCD icon was highly inappropriate, there were still 4% of males who believed that it was highly appropriate. Furthermore, it is interesting to note that none of these three categories of females (0%) considered the Go/Visit icon as highly appropriate.

Level of Education Analysis

As for the IE Go/Visit icon, the High school students had extreme views. 50% of the students considered the icon to be highly inappropriate, whilst another 50% of the students thought it was highly appropriate. Most of the College students felt the icon either inappropriate (33%), neutral (33%), or appropriate (33%). For the University level, nearly half of the students (41%) had no opinion either way. However, there were 13% of the students who considered the icon highly inappropriate, and 22% of the students who thought it inappropriate. With the Graduate school background, there were 40% of the students who regard the icon as highly inappropriate, and none of the students (0%) thought it high appropriate.

As for the Safari Go/Visit icon, all of the High school students (100%) regarded it as highly inappropriate, whilst 67% of the College students thought the icon to be inappropriate, 33% were Neutral. For the University level, most of the students believed the icon inappropriate (33%) and neutral (28%). As for the Graduate school level, most of the students had negative views of highly inappropriate (50%) and inappropriate (50%).

There were 50% of the High school students who regarded the CCD Go/Visit as neutral, whilst 50% of the students thought it highly appropriate. Most of the College students felt that the icon was either neutral (33%), inappropriate (33%), or highly inappropriate (33%). Though most of the University students considered that the icon was highly inappropriate (45%) or inappropriate (32%), there were 6% of the students who thought it appropriate and 1% of the students who thought that it was highly appropriate. 70% of the Graduate school students who regarded it as highly inappropriate, whilst 10% of the students thought it appropriate.

User Experience Analysis

In general, the participants were less critical (lower levels of highly inappropriate/inappropriate) and more approving (higher levels of appropriate/highly appropriate) with increasing user experience levels.

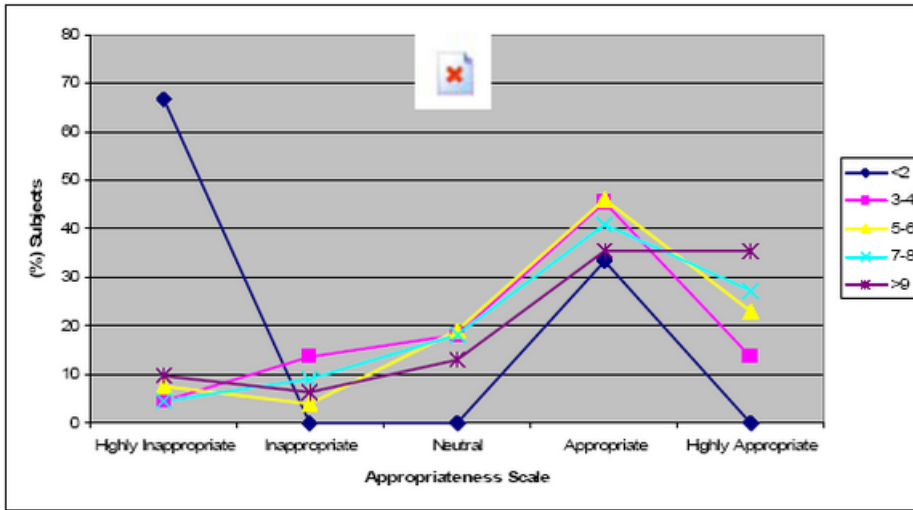


Figure 1: Comparison of IE Icon Appropriateness (Experience Level) - Stop Function

Interestingly, with the IE Stop icon this had the effect of differentiating between the experience level groups, with an increasing highly appropriate score being closely associated with the level of experience.

Of all the three browsers, participants were most critical of the CCD icons in terms of their appropriateness. In some ways this might be a result of their lack of experience with these icons and their familiarity with IE and Mac icons. This is an interesting finding since they were able to identify the meaning of the CCD icons almost as well as the IE and Safari icons.

Analysis of User Preference – Test 3

When the participants were asked to rank the browser icons in order of preference for each function they unanimously preferred the IE icons over the Safari icons, and in turn the Safari icons over the CCD icons. This result was anticipated and again to some extent is the result of familiarity of use.

Analysis of Variance

To determine whether there are significant differences in gender and user experience, one-way analysis of variance (ANOVA) was used to examine and validate the data, in terms of icon perspicacity, appropriateness, and user preferences. Analysis of the results in terms of level of education and type of platform (PC or Mac) was ruled out due to the lack of balanced data.

Gender Analysis of variance

In terms of perspicacity, some of the IE, Safari, and CCD web browser icons were difficult for the participants to identify, as mentioned earlier. By the use of .05 significant levels, the

effect of gender between females and males towards IE and CCD browser icons was not significant. There was however a significant effect for the Safari Forward icon ($p = .047 < .05$).

In terms of appropriateness, there was no significant difference of CCD icons between female and male groups. This shows that both groups had similar views. However, there was a significant difference for the IE Home ($p = .018 < .05$), Refresh ($p = .003 < .05$) and Stop icons ($p = .003 < .05$), together with the Safari Forward ($p = .038 < .05$), and Home icons ($p = .006 < .05$).

User Experience Analysis of Variance

In terms of perspicacity, the problematic Go/Visit icon was not significant within all three selected types of web browser (IE Go/Visit, $p = .953$; Safari Go/Visit, $p = .881$; CCD Go/Visit, $p = .532$). This indicated that the participants seemed to have equal agreement across different experience levels of computer use. However, there was a highly significant difference for the IE Refresh ($p = .000 < .05$), IE Stop ($p = .000 < .05$), Safari Stop ($p = .000 < .05$), and CCD Stop icons ($p = .000 < .05$).

With regards to appropriateness, there was no significant difference for the IE and Safari Go/Visit icons (IE Go/Visit, $p = .692$; Safari Go/Visit, $p = .691$). Nevertheless, there was a significant difference for the CCD Go/Visit icons ($p = .021$) amongst five different levels of user experience. There was also a significant difference for the IE Forward ($p = .010$) and Safari Home icons ($p = .009$). For user preference there was a significant difference for the Refresh ($p = .019 < .05$) and Search icons ($p = .026 < .05$).

Conclusion

China's Internet community is expanding rapidly, and has now overtaken the USA to become the largest Internet user base in the world. By 2012, there is estimated to be over 900 million Internet users in China.

Having conducted a thorough literature review, we have found very few citations with regards to web browser developments specifically for Chinese users. The success of a Chinese web browser may depend on iconic perspicacity, appropriateness, and cultural preferences (Evers 1997). Therefore, the web browser and its icons should be intuitive, associative and easy to navigate, in supporting the comprehensibility of Chinese web users. With the rapid growth of usage of computers and the Internet, designers need to be culturally-sensitive to specific users needs (Barber and Badre 1998; Bourges-Waldegg and Scrivener 1998; Every 1999; Yeo 2000).

Within this study a comparative experimental evaluation with 103 participants' representative of the demographic distribution of hegemonic interests has been conducted using an online resource. The results of this study support the theory that Microsoft's Internet Explorer has successfully globalised non-English speaking internet users within Taiwan.

In terms of perspicacity, most users could easily associate the web browser icons with their intended functions. However, there were several usability problems reported with the IE 7.0 Go/Visit and Search icons. The Apple Safari web browser icons also caused several problems for users, of particular note being the Favourite, Go/Visit and Refresh icons. It is suggested that the IE Go/Visit icon should be reworked to avoid confusion with the Forward

browser icon. The authors believe that perhaps the magnifying glass (Search) icon is now outdated and not recognized by the younger generation. With regards to the Safari Favourite icon, the plus sign might be confusing users with its mathematical connotation.

In terms of appropriateness, the participants felt that several of the IE icons were either highly inappropriate or inappropriate; in order of severity these were: Go/Visit (38%), Favourite (30%), Stop (27%), and Forward (25%). For the Apple Safari icons, participants felt that several icons fell into the categories of either highly inappropriate or inappropriate; in order of severity these were: Go/Visit (62%), Favourite (52%), Forward (27%), Backward (25%), and Refresh (25%).

In order to gauge the level of support amongst Chinese computer users for a web browser containing specifically designed culturalised icons, we compared icons developed using the Culture-Centred Design methodology with those of IE 7.0 and Safari 3.0. Analysis of our results shows that the CCD icons had perspicacity rates, which were almost equivalent to those of IE 7.0 and Safari 3.0, however, when we analysed the data on appropriateness, it was clear that several of these icons had high levels of either highly inappropriate or inappropriate: Go/Visit (69%), Refresh (65%), Favourite (62%), Forward (48%), Backward (48%), Stop (44%), Search (40%), and Home (38%). To some extent, this is comprehensible due to the high levels of PC users (98%) amongst the participants. However, we intend to further develop these to lower these levels in line with those of IE.

The CCD icons used in this testing have been developed over several years, using Taiwanese participants, we believe that these show promise as alternative browser icons to both IE 7.0 and Safari 3.0. We fully accept that several of these require further enhancements to increase their perspicacity and appropriateness. We would recommend further work on the Go/Visit, Refresh, and Favourite icons.

Icon preference testing results clearly show that the vast majority of participants prefer IE 7.0 icons over Safari 3.0 icons; and Safari 3.0 icons over CCD icons. These results are irrespective of gender, educational level, and user experience. Again, to some extent, this is predictable given the high level of PC (IE) users.

The results of this study provide a solid foundation for future development of all web browser icons. We believe that even the most successful browser, i.e. Internet Explorer can be improved by remodeling their Go/Visit and Favourite icons.

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Dr. Te-Hua Fang is a full Professor within NFU specialising in nano design and fabrication techniques. He also has interests in systems design and interfaces for Chinese users. He graduated with a Masters degree and a PhD in Engineering from universities in Taiwan and holds research links with top universities in Germany and the UK.

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