

# ***Website Usability in Asia ‘from Within’: An Overview of a Decade of Literature***

**Ather Nawaz**  
**Torkil Clemmensen**  
Copenhagen Business School, Denmark

**Abstract:** As the number of website users in Asia grows, there is an increasing need to gain an overview of HCI research about users and websites in that context. We present an overview of HCI research on website usability in Asia ‘from within’, which outlines the articles written by researchers with affiliations to universities in that part of the world. Based on a keyword approach to major HCI research outlets, we identified and analysed 60 articles from the period 2001 to 2011. Our results indicate that academic websites, e-commerce websites and tourism websites were the most studied web site domains in Asia. Typically, university graduates were used as participants in a laboratory setup and asked to navigate and find information on a website. No systematic use of cultural variables or theories to code, analyse and interpret data and findings was found. We discuss our results and the need for a greater sensitivity to what is ‘local’ and ‘from within’ in HCI research and what this can add to the existing literature on website usability.

## **Keywords**

Website, Usability, User Experience, HCI, Asia, UX, Local, Literature, review.

## **1 INTRODUCTION**

The number of users of websites in Asian countries<sup>1</sup> is growing at faster rate than the rate of growth in Europe in the recent years. Asia has had 210.8 million new internet users since 2000 (Pingdom, 2010). This article provides an overview of human-computer interaction (HCI) research on website usability in Asia that has been performed by researchers affiliated with institutions in Asia from 2001-2011. Due to strong economic growth and the pattern of internet development in Asia, the use of websites has become a standard means of searching for information and buying commodities and products in the region. However, the majority of research studies in HCI focus on users in the USA, Canada and European countries, or at best compare one of those countries with countries in Asia (Clemmensen & Roese, 2010). Few studies have focused on HCI and website usability in Asia

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<sup>1</sup> Asian countries were chosen on the basis of United Nations Geoscheme. The macro-geographical regions are arranged to the extent possible according to continents. <http://unstats.un.org/unsd/methods/m49/m49regin.htm>

specifically, despite HCI being of key importance to the ICT industry in that part of the world (Smith et al., 2007; Yeo et al., 2011).

Academic HCI research has advocated the importance of website usability for decades. Website usability issues include overwhelming amounts of information, complexity, lack of structure, insufficiency of search mechanisms, lack of fit with users' preferences for colors, inappropriate metaphors, and difficulty of navigation (Nielsen, 1994). Existing theories of usability are likely to be applicable in Asia, but website usability may not be universal and culture might influence the perception of usability (Frandsen-Thorlacius et al., 2009, Yeo, 1998). More generally, topics chosen for HCI research, data collection, analysis and discussion may all to some degree be 'local' or 'indigenous' to different regions of the world (Clemmensen, 2012). For example, the theory and method of so-called 'cultural markers' might be of special importance to research on Asian websites (Sun, 2001). Similarly, Hofstede's (1980) national cultural dimensions have turned out to be relevant theory for HCI research on Asian websites, see for example (Smith et al., 2004), while rarely being used to examine US websites.

There are Asia-specific controversies for website usability related to preference for website language, content and visual design (Choong & Salvendy, 1997; Marcus & Hamoodi, 2009). Further, there are several issues and gaps that will need to be filled out through existing or new theory. Such theories must address issues such as the variation of website structure within the Asian region, the relation between usability and user experience in Asian websites and the design of bilingual websites with two or more languages presented concurrently on a single webpage. There may also be a need to look into Asia-specific HCI methods, if any, to study website usability in that region. Finally, being aware and sensitive to the numerous variables relevant to understanding website usability in Asia may in fact be most possible for HCI researchers who live in the region (Clemmensen, 2012). In sum, we decided to focus on usability research performed by HCI researchers affiliated to Asian institutions. This paper aims at answer the question: *What local HCI research has investigated website usability in Asia?*

This article shows how the research in HCI and website usability in Asia has evolved over a period of 10 years from 2001-2011. It examines the distribution of website usability research across countries, use of theories, study topics and what genres of websites that have been researched during this period. The article provides a summary of research with different methodological approaches, such as theoretical analyses, field studies, experiments, ethnographies, interviews and surveys. The article also looks into the kinds of participants in the studies and how many participants were used in each. Finally, the article discusses several gaps in the literature and identifies key areas of future research for website usability in Asia and in general.

## 2 BACKGROUND

The number of website users in Asian countries increased drastically in the decade 2001-2011. According to the US Census Bureau, in 2011 44% of the world's internet users lived in Asia<sup>2</sup>. Due to strong economic growth in internet development in Asia in the preceding years, website use became a normal part of daily life. During the period, the software and hardware industries and web-based services such as e-commerce developed even further in large Asian countries like Japan, India and China (Smith et al., 2007). People started to use the web to search for information and to buy commodities and products. Social media, e-commerce and web applications, many of which were unfamiliar to USA and European users and HCI researchers. For example, Sina Weibo, a site similar to Facebook with over 100 million users (Joinson, 2008) were used by hundreds of millions of people in Asia.

Historically, HCI and usability studies originated mainly in Europe and the United States while not much is known about the history of HCI research in Asia. Anecdotal evidence suggests a rapid development of research took place in the period 2001-2011, and that HCI research that focuses on the region, or is hosted in Asia, has been published in a variety of HCI journals (Chui Yin Wong, personal communication, 24 November, 2011). Development of HCI research on a national level has been described as 'institutionalizing HCI research' and conceptualized as a process that occurs in evolutionary stages (see table 1). Applying these stages on a country level showed that HCI research in the Asian region as a whole rapidly developed to be an important factor in the design and development of products (Smith et al., 2007). However, the evolutionary approach to the development of HCI is limited in different aspects, one obvious one being that technology developed in one country often spreads rather swiftly around the world and does not occur in stages in each country (Clemmensen, 2010).

**Table 1:** Stages of usability maturity and their indicators (Smith et al., 2007)

| <i>Level</i>      | <i>Indicators</i>  |
|-------------------|--|
| Recognised        | Problem recognition, performed processes                         |
| Considered        | Quality in use awareness, user focus                             |
| Implemented       | User involvement, human factors technology, human factors skills |
| Integrated        | Integration, improvement, iteration                              |
| Institutionalized | Human-centred leadership, organizational human-centeredness      |

A number of research studies show that users differ importantly according to culture (Day & Evers, 2001; Callahan, 2005; Marcus & Hamoodi, 2009). Studies of user performance indicate that a cultural fit between technology and target user group may be important. Wan Rahim et al. (2009) conducted a survey of local Islamic websites and suggested that Middle East and Malaysian users performed faster when they used websites that were targeted towards their cultural groups. Studies of user preferences indicate that people from different countries may exhibit specific preferences for

<sup>2</sup> <http://www.census.gov/>

layout of the websites. For example, Callahan (2004) suggested that users in Japan and Malaysia may have a preference for a vertical layout, whereas users in Austria and Denmark may have a preference for horizontal page design. The study used Hofstede's dimensions of national culture as the main framework to examine cultural differences between different countries. One possible shortcoming of this approach, and of many other studies that use national culture as a variable, is that it did not discuss within country differences between user groups. For example, Callahan (2004) used 20 webpages from Malaysia, which were presented to participants in Malay, or in Malay plus an English version of the homepage, but did not discuss which particular language, ethnic and cultural groups, among the many different languages within Malaysia, that the study concerned.

Every group or category of people, it has been argued, carries a set of common mental programs that constitute its culture (Hofstede, 1980). There may, therefore, be systematic difference in the cognitive styles of Asians and Westerns, for instance; Asians tend to apply a holistic view of the world, as ancient Chinese thinkers promoted this way of thinking, whereas Western people tend to apply an analytical view of the world following the traditions of ancient Greek thought (Nisbett, 2003). Likewise, most 'high context' cultures, such as Asia and Latin America, rely heavily on contextual clues, whereas low context cultures (for example the United States, Germany and Scandinavia) rely on more definite cues, such as the written word (Nantel & Glaser, 2008). For example, members of individualist cultures such as Germany tend to perceive objects in context independently, while members of collectivist cultures such as Malaysia focus on the relation between objects and the entire field (Kühnen et al., 2001). The difference between cultural groups with a focus on individual objects versus objects-in-context has also been explained by reference to the different perceptual environments of each cultural group (Miyamoto et al., 2006). For example, people living in densely populated megacities might experience a different and more contextual physical environment, compared those living in sparsely populated areas. People in Denmark will tend to see a fish when presented with fish in an aquarium, while people in China will see an aquarium, because aquariums are common in city life in China and rare in city life in Denmark. Similarly, talking to someone on a mobile phone when you are more or less alone in the street is a different user experience from talking to someone on the mobile phone when surrounded by other people also using their mobile devices. In summary, the country or regional culture of users and designers affect individual experiences on a basic cognitive and perceptual level, and it is highly relevant to HCI in many ways.

Cultural differences influence HCI in more ways than just directly through users' perception and cognition. The mental program of designers and developers of websites may be more or less embedded in and anchored to the local culture, resulting in variations in their understanding of local users' needs. Faiola and Mateio (2005) compared the online performance of 27 Chinese students and 26 American students who completed online tasks. The results indicated that online task time performance of participants was faster when participants used web sites created by designers from their own national culture. Finally, differences in language usage between different cultures may have complex and not yet understood implications for the usability and user experience of websites.

Differences in language and culture are of key importance in the usability of websites and should be considered when dealing with different cultures.

## **2.1 Website usability and user experience**

Website usability and user experience may not be universal across different countries. Successful usability evaluation depends on culturally-embedded meaning of objects which is not explained appropriately by a universal understanding of usability (Smith & Yetim, 2004).

The concept of ‘cultural markers’ had been of particular importance to understanding website usability. The idea is that when users browse web pages, they subconsciously apply cultural preferences to evaluate the design (Sheppard & Scholtz, 1999; Juric et al., 2003). Cultural markers are interface design elements and features that are prevalent, and possibly preferred, within a particular cultural group. In other words, cultural markers in web design are the cues of picture, icon, shape, colour, texts and tone frequently used in a particular culture to interpret meaning. Users are receptive and possibly prefer websites that display cultural markers of the local culture. Targeting a user group with cultural markers could thus potentially increase the usability of websites. It had been shown that users from different cultures preferred different modes of cultural markers (Sun, 2001). Sun (2001) investigated strategies for the development of representative interfaces in a multicultural context. Her study used Hofstede’s (1980) power distance and Marcus’s (2000) approach for multi-dimensional web-interfaces to identify cultural representations of multicultural Malaysia. Marcus (2000) used cultural markers to explore three characteristics of web sites: Language, colour, and pattern/image. The result of the study pointed out that those websites that use cultural markers in their design are accepted by their target audience. However, it is difficult to generalise cultural markers for users in the frequently multi-ethnic and multicultural societies of Asia. For example, users in Malaysia may well have different cultural backgrounds, such as Chinese, Malay, and Indian. Each of these cultural groups may have different ways of relating to cultural markers embedded in websites. While looking into a country such as Pakistan, there are different cultural characteristics that need to be taken in consideration in website usability. For example, while looking on a university website users there consider their association with their family of importance for how they manage information (Nawaz et al., 2011; Nawaz & Clemmensen, 2010).

In summary, research on website usability in Asian countries has been emerging rapidly in the period from 2001-2011. Studies of HCI and usability started to get a focus in countries like China and India in late 1990s (Smith et al., 2007). This research was practiced in the traditional way with university students as participants, a focus on academic websites and government websites, and on quantitative research. Furthermore, the countries studied, especially Western Asia<sup>3</sup>, were strong on Muslim majority values at that time, and websites in these countries became a medium through which Muslims and Islamic scholars accomplished many of their religious obligations (Murni & Abu Osman, 2011). Thus, we expected our review of research on HCI in Asia research to show

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<sup>3</sup> The macro-geographical regions of western Asia <http://unstats.un.org/unsd/methods/m49/m49regin.htm>

interest in religious identity and evaluation of religious websites, a topic that so far has been little studied (Al-shamaileh et al., 2011). More generally, from the literature on cognition and culture reviewed here, we expected many studies of website usability in Asia to focus on the religious, social, organizational, or cultural context of websites.

### **3 METHOD**

A keyword approach was applied to search in scientific repositories that covered all major outlets for HCI research. Initially, a search of website usability in Asia was conducted on Google scholar. It showed a distribution of publications across multiple journals and conferences. The initial overview of the search results showed that a search was needed for “website usability in Asia” across multiple disciplines, journals and conferences. We chose to approach the search for relevant "website usability in Asia" articles by searching major academic databases which are widely used to retrieve HCI research.

#### **3.1 About the analysts**

The analysis was primarily conducted by the first author, who has the competences and background required for analysing the literature on website usability in Asia with an internal lens. The first author is a Pakistani national who grew up in Lahore and he has an undergraduate degree in computer science from Lahore University and postgraduate degrees from Sweden and Denmark. The first author speaks Urdu, English, Punjabi and some Danish. One of the observations which initiated our analysis was the observation during the literature search and data collection that despite the fact that 29 million people have internet access in Pakistan, there was no evidence of HCI and usability research. The second author is Danish with no formal affiliation to Asian Universities and HCI in Asia. His main qualification for participating in this paper was his experience and knowledge gained from coordinating a research project on cultural usability with researchers in India and China.

#### **3.2 Choice of Academic Databases**

The articles related to website usability in Asia were being found in multiple academic databases, because there was no single repository for HCI research or website usability in Asia. Focusing on top HCI journals and conferences would not provide optimal results, because emerging HCI research, as we estimated was the case in Asia, often straddles multiple disciplines (e.g. engineering, IS, information science, psychology, and human factors). When searching for relevant literature, it was therefore necessary to look not only within the HCI literature as determined by its standard journals and conferences, but also outside the field (Webster & Watson, 2002). Hence we decided to search in largest, most famous, and most comprehensive scientific repositories. The obvious risk of searching in these repositories rather than focusing on a narrow set of conferences or journals was that we could be overwhelmed by the potential large number of HCI research articles on the topic studying question, and that we might find articles that were not appropriate to the topic.

However, in our judgement, this risk was worthwhile in order to catch the potentially interesting and possibly widely scattered articles on website usability in Asia.

We chose four academic search engines, “ACM”, “Web of science”, “Scopus” and “Science Direct”, to search for relevant articles for the study. We selected these four databases because they covered all major HCI journals and conferences. We also looked other HCI researchers’ literature review papers and their choice of HCI databases (Clemmensen, 2010; Bargas & Hornbaek, 2011). The four repositories cover 20,200 publication venues. We searched for the articles between 2001 and 2011. This period of time was selected because there was an incredible growth in the internet and its users in Asia between 2001 and 2011 (Pingdom, 2010). The penetration of the internet in Asian population was 20.1% in 2011 and Asia represented 43.4 % of the world internet users at that time, the most in the world. In all, Asia showed a growth of 568.8 % in internet use over the period<sup>4</sup>.

### **3.3 Keyword and screening criteria for relevant articles**

To identify articles within the set of chosen outlets, we used the two keywords: *website* AND *usability* to search in the titles, abstracts and keywords of the articles. This procedure had implications: we found only those articles which focused on website and usability in the abstracts of the articles.

After using the keywords to identify a list of articles, we wanted to include only those articles that focused on website usability in Asia. Therefore we defined the additional screening criteria of country of authors/publication and general topic:

- Country of authors’ university: We used the first author’s university affiliation as an indicator of the geographical region of the research article. The country of the first author’s university was deemed suitable for refining the list of articles to those relevant to HCI in Asia because there was no other reliable common factor that could be tracked. The aim was to include only those articles that addressed website usability in an Asian country.
- General topic of the articles: The articles were screened to see if they had sufficient focus on website usability topics by reading all abstracts, skimming the articles and deciding whether to include them or not.

The search results from repositories were imported and duplicates (identical publications, but from different databases) were removed. Only articles written in English were included because it was difficult to interpret focuses of articles from the summary of articles which were not written in English. In the later stage, we included seven papers (see appendix A) which were identified by a research assistant from Chinese academy of Science as good examples of Chinese- language research in on website usability.

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<sup>4</sup> An overview of internet usage, data and statistics worldwide: <http://suite101.com/article/internet-usage-data-and-statistics-worldwide-a235149>

### **3.4 Propositions**

A number of propositions about HCI research on website usability in Asia were formed before the analysis of articles. These propositions were based on the literature discussed above and more. We also formulated additional propositions about the use of research methods and types of theory used in the articles. This resulted in the following propositions about HCI research papers on website usability research in Asia prior to analysis:

1. The number of publications on website usability in Asia would have increased over the period 2001-2011 due to increased interest in the topic linked to a rapid increase in website users in Asia at that time.
2. A majority of the articles would have been written by authors with affiliations to universities in China and India, due to the large size of these countries and their corresponding populations of academic researchers.
3. For the use of theories, cultural theories would be used as major frameworks for studies of websites and usability in Asia, because Asian users feel a strong association with their local culture. Such theories would be used to explain whether websites are culturally contextualized according to users' local culture, and whether symbols and national colours are appropriated.
4. The topics studied in HCI research on website usability in Asia would mainly be usability evaluation methods and website design methods in general, and the findings would involve analysis in terms of cultural theory. The reason for this proposition was that existing usability theory should remain relevant in Asia, though perhaps with additional cultural aspects.
5. The particular genres of websites that would have been studied would be university websites, religious websites and government websites in addition to other website domains. University websites would be studied because much of HCI research has traditionally been conducted in universities and has tended to use students as participants. Religious websites would be studied because religion has been a central feature of a number of Asian countries over the period covered. Government websites would be studied because governments have recently begun providing many online services to potentially a large user groups, making testing the accessibility and usability of these services for their citizens a critical area of study.
6. A large proportion of the articles would focus on cultural markers and usability, as it had been shown that users from different cultures tend to prefer different modes of cultural markers and that there are interface design elements and features that are prevalent, and possibly preferred, within particular cultural groups (Sun, 2001).
7. There would be more quantitative studies (for example questionnaires) than qualitative studies (for example open interviews), because quantitative science has dominated HCI research in general (Cairns, 2007). In many Asian countries, HCI research was an emerging discipline during the period, and emerging disciplines often starts out using conventional research methods in the discipline, suggesting a likelihood of quantitative methods.

8. The participants in the studies would have been the representative of the studied domains. We would expect a reasonably large body of articles with rural users as study participants. We expect this because governments and organizations are not only providing online services through websites to users living in urban areas but they are also trying to provide these information and services to users who live in rural areas.

## 4 ANALYSIS AND RESULT

We searched for relevant articles sequentially in each of the selected four academic databases.

- *ACM Digital Library*. We searched for *website AND usability* in the abstracts of the articles between 2001 and 2011 and found 231 in ACM database and affiliated Organizations of ACM database. Since ACM did not provide refinement though locations, we screened the 231 articles for the locations of the institutes and first author's location. The 231 articles were retrieved from 100 different institutions. In this list of articles, four articles were not presented by any institute but rather by a company or individual person (IBM, Oracle, Sun Microsystems and Aaron Markus). We selected one article from these four articles because this discussed culture and choice of users' interfaces and placed it in 'China'. Ultimately, we were left with 17 articles from the ACM database. One of the articles was not available for downloading. We downloaded the remaining 16 articles in the final ACM list.
- *Scopus*. The search for *website AND usability* was conducted in the abstracts of articles between 2001 and 2011 and resulted in 289 articles. A total of 44 articles from the 289 articles were from the Asian region. Of the 44 articles, 13 articles were not available online, which left us with 31 articles downloaded.
- *Web of Science (SSCI)*. The search for *website AND usability* in the abstracts of the articles between 2001 and 2011 resulted in 265 articles. The search was applied to the database fields of article title, abstract and keywords. After screening the articles according to the geographical locations, we were left with 31 articles. Five articles could not be downloaded due to unavailability of articles in digital form, resulting in 26 articles from web of science.
- *Science Direct*. We searched for *website AND usability* in the abstracts of the journal articles and found 57 articles. Of these, after screening of abstracts for location and topic, we were left with 13 articles.

Table 2 provides an overview of the found articles. The Scopus database appears to be the most comprehensive with 31 articles on website usability in Asia.

We combined all the articles from the four databases and found 26 (29%) articles replicated in one or more databases. After removing the duplicate publications, we were left with a final list of 60 articles for analysis. The articles were analysed further according to the propositions derived from other studies. In order to search for relevant information in articles, the abstracts of the articles were read thoroughly. The introduction and conclusions were read to search for relevant information if it was not available in the abstract of the article. The body of the article was studied to search for

information if necessary. We coded the articles for categories of interest. The choice of categories was informed by the propositions presented in section 3.3. The coding was done by going through all the 60 articles to look for information that were relevant to each proposition. The first author coded for all propositions and all the articles. The abstract of all articles were read thoroughly and body of the article was skimmed to search for relevant information. During this process, codes were generated to find the theories, methods, studied topics and type of users been used. As a control of the coding quality, the coding done by the first author was compared with a coding done by the second author for the “theory” used in the 60 articles, using the set of “theory” codes developed by the first author. The comparison of the two coding was performed qualitatively with both authors discussing disagreements and reaching a consensus.

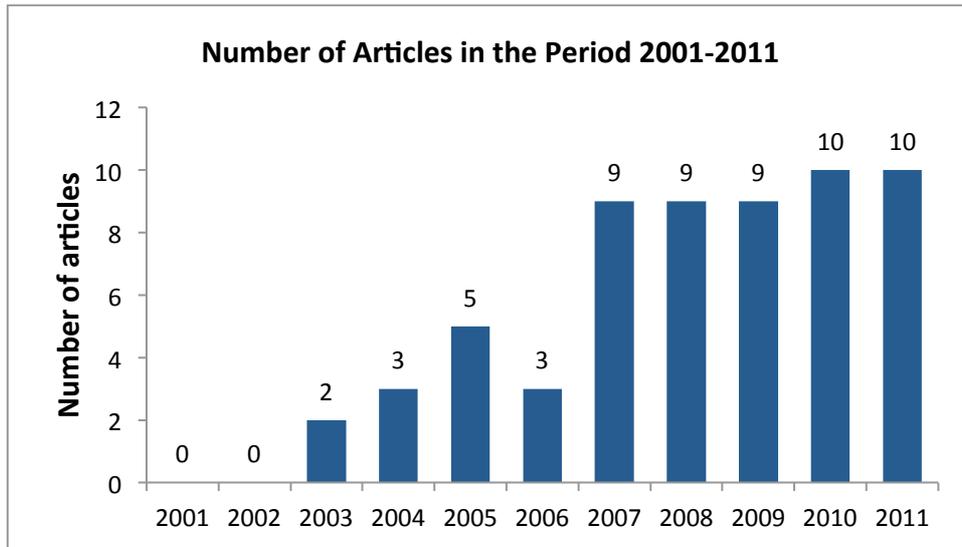
**Table 2:** Distribution of articles across different regions of Asia

| <i>Database</i>   | <i>ACM</i>  | <i>Science Direct</i>   | <i>Scopus</i>  | <i>Web of Science</i>  |
|-------------------|---|---|--|--|
| Country           | China ( 7 )<br>Japan ( 5 )<br>Taiwan ( 1 )<br>Korea ( 1 )<br>Malaysia ( 1 )<br>Turkey ( 1 ) | Taiwan ( 4 )<br>China ( 3 )<br>Turkey ( 2 )<br>Oman ( 1 )<br>South Korea ( 1 )<br>Iran ( 1 )<br>Japan ( 1 ) | Japan ( 7 )<br>China ( 7 )<br>South Korea ( 2 )<br>Taiwan ( 4 )<br>Malaysia ( 5 )<br>Jordan ( 2 )<br>Iran ( 2 )<br>Singapore ( 1 )<br>Turkey ( 1 )<br>Oman ( 1 ) | Taiwan ( 9 )<br>South Korea ( 6 )<br>China ( 3 )<br>Malaysia ( 2 )<br>Turkey ( 2 )<br>Iran ( 2 )<br>Japan ( 1 )<br>Singapore ( 1 ) |
| <b>Total = 86</b> | <b>16</b>   | <b>13</b>   | <b>31</b>  | <b>26</b>  |

#### **4.1 The number of publications on website usability in Asia**

We wanted to look into the articles’ distribution in different repositories during the period 2001-2011. With an increase in internet users in Asia, we expected that the research in website usability would have grown every year during the period of interest. Figure 1 shows the trend in publication of the articles of interest in the decade investigated.

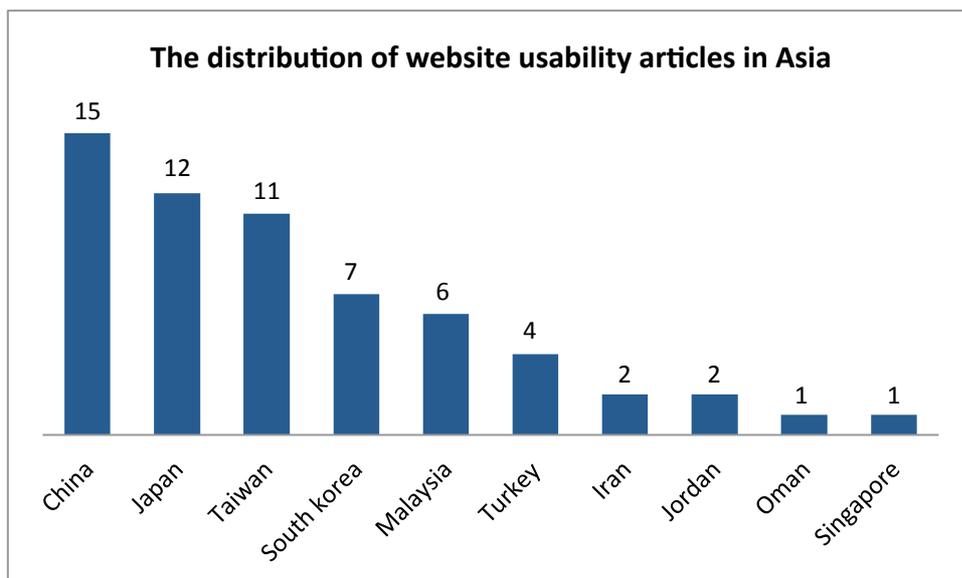
Figure 1 illustrates that, as expected, there was indeed a trend, with publications on “website usability in Asia” increasing during the investigated period of time. From the beginning of the period with 0-3 articles published per year, to 10 articles published per year at the end of the period. Figure 1 also shows that publications on “website usability in Asia” only began to appear from 2003.



**Figure 1.** The distribution of 60 “website usability in Asia” research articles in the period 2001-2011.

#### **4.2 The distribution of articles on Website Usability in Asia**

A majority of the research articles could be expected to come from China, Japan and India, due to the population size of those countries and their correspondingly greater number of academic researchers. Figure 2 shows the distribution of articles on website usability in Asia across different Asian countries. Figure 2 illustrates that a majority (25%, 15 of 60) of the “website usability in Asia” articles were from China (and Hong Kong), and nearly as many website usability articles were retrieved from Japan (20%, 12 of 60) and Taiwan (18%, 11 of 60). In contrast, little research on “website usability in Asia” has been conducted in Western Asia.



**Figure 2.** The distribution of the 60 articles on Website Usability in Asia across countries

### 4.3 The use of theories

From previous research it could be expected that the use of theories would be limited, and that cultural theories would be the most frequently used frameworks for studies of websites and usability in Asia. The first of these propositions turned out to be true - the use of theory was scarce in many of the investigated articles. A little more than half of the articles (61%, 37 of 60) mentioned any identifiable theory. In those cases, we read the paper to determine whether it could be characterized as a use of a particular theory or not. Table 3 shows the theories used in the articles. In this table and in the following, the letter *P* with a number refers to an article in the list of the 60 investigated articles in Appendix A.

The second proposition - that cultural theories would be the most frequently used frameworks for studies of websites and usability in Asia - was not true. Table 3 illustrates that despite the fact that the investigated articles were carefully selected to be about “website usability in Asia”, even among the articles that did mention theory, cultural theory was rarely used. The most frequently used theories were those related to behavioural intention (P7, P19, P37, P44, P48), learning (P6, P20, P23, P55, P4) and a number of different cognitively oriented theories such as mental workload, cognitive theories and cognitive aging theory (P13, P16, P22, P27, P47). Only a few articles (8%, 5 of 60) used cultural theories or globalization theories to conceptualise what was specific about “Asia”. Of the five cultural theory articles, four articles used Hofstede’s cultural dimensions.

**Table 3:** Theories used in articles on “website usability in Asia”

| <i>Theories</i>         |                        |                              |                       |
|-------------------------|------------------------|------------------------------|-----------------------|
| Aesthetic               | P34                    | Information Desire           | P17                   |
| Ant colony optimization | P60                    | Information Foraging Theory  | P11                   |
| Behavioural Intention   | P7, P19, P37, P44, P48 | Information Learning         | P6, P20, P23, P55, P4 |
| Cognitive Aging Theory  | P13                    | Information Management       | P5, P21               |
| Cognitive Theory        | P22, P27, P47          | Mental workload              | P16                   |
| Cultural Dimensions     | P2, P8, P36, P56       | Theory of Gestalt psychology | P3                    |
| Disconfirmation Theory  | P22, P52               | Theory of Globalisation      | P10                   |
| Empirical law           | P35                    | Trust                        | P39                   |
| Graph Theory            | P31, P32               | Visual                       | P15, P30, P33, P58    |

Another subset of the articles used website usability as the general framework of the study, without mentioning any specific theory. The use of website usability as a framework raises the issue of whether such papers should be classified as concerning theory, frameworks or a method of study. Table 4 shows the articles that used website usability as a framework, and also the different focuses within website usability (i.e., information navigation), if any.

Table 4 illustrates that the articles used website usability as a general theory/framework of study and did not emphasize any particular characteristic of website usability. For a few articles, the website usability framework appeared to have a focus on a particular issue. For example,

information navigation studies focused on navigation burden (P40), information retrieval and mining web structure (P41), evaluation of website metrics for navigation (P50) and general user interface navigation (P51).

**Table 4:** Articles using website usability as a framework theory

| <i>Website usability as a framework theory</i> |   |
|--|---|
| Active control                                 | P24   |
| Information Navigation                         | P40, P41, P42, P50, P51   |
| Others   | P12, P46, P49   |
| Quality  | P38   |
| Website usability                              | P1, P9, P14, P18, P25, P26, P28, P29, P43, P45, P53 P54, P57, P59 |

Some articles were studies of usability evaluation methods (P27, P38, P41, P43, P59 and P60), rather than studies that used such usability methods to evaluate the websites or do other kinds of research. Thus, these articles did not clearly discuss any theory, but focused on methods and method development. The methods were rationalized, customized and presented as new methods, for example using new expression for the previous methods with addition of a step (i.e., Scenario based walkthrough: Colony meta-heuristic technique modified heuristic usability evaluation).

#### 4.4 The studied topics

We wanted to look into the topics that were studied most in the selected articles. We expected the studied topics to be usability evaluation methods and website design methods, and expected the findings to be analysed in terms of cultural theory. Table 6 shows the distribution of the studied topics across the 60 articles. It is clear from Table 6 that a usability analysis of a website was a common (43%, 26 of 60 articles) and accepted form of research into website usability in Asia.

**Table 6:** Studied Topics of the articles

| <i>Studied Topics</i>                  |   |
|--|---|
| Usability analysis of a website domain | P1, P2, P4, P6, P9, P10, P11, P12, P14, P14, P21, P22, P23, P25, P26, P28, P29, P31, P35, P44, P45, P46, P47, P52, P53, P55 |
| Analysis and methods                   | P27, P38, P41, P43, P49, P50, P54, P59, P60   |
| Asian users website evaluation         | P36   |
| Blind users experience                 | P32   |
| Design solution for older adults       | P13   |
| Factors affects usability              | P8, P18, P56  |
| Interactive learning                   | P20   |
| Information desire                     | P17   |
| Mental stress                          | P16, P40, P51   |
| Mobile networking                      | P19   |
| Portal Information Management          | P5  |
| Trust                                  | P34, P39, P48   |
| Visual interfaces                      | P3, P30, P33, P58   |
| Web mining                             | P7, P42, P57  |

The analysis and methods for website usability, second row in table 6, involved evaluation of websites through Latent Semantic Analysis (P27), ranking website pages (P31, P38), Markov Model based website measures (P41), scenario based walkthrough (P43), automatic evaluation metrics (P50), automatic data collection system for website usability (P59) and the Colony meta-

heuristic evaluation technique (P60). These studies represented a type of research that focussed on methods and techniques for evaluating websites, rather than the usability of the website itself. Visual interfaces were the single most studied explicit topic of website usability in Asia research. The visual interface research emphasized Gestalt-like perception measures (P3), factors affecting webpage perception (P30), iconic hyperlinks (P33) and gazing point of information (P58).

The articles that studied topics related to trust (P34, P39 and P48) emphasized trust development with the users of a website and how digital aesthetics plays a role in the process. The articles on trust further analysed users' intentions and shopping experiences and how they could be converted into purchasing intentions.

Moving on towards the studied topics of stress and its relationship with websites, three articles (P16, P40 and P51) emphasized the mental stress and navigational burdens of users when searching for information. Navigational burden and stress were analysed via metrics such as number of clicks, task efficiency and number of errors. All the studied topics that related to the mental stress of the users discussed the mental stress of search tasks and navigation and its relevance to the website usability. While the other topic of study focused on information purchase intention (P24, P37) and website usability. Web mining articles (P7, P42 and P57) focused on the efficiency and reliability of data for users.

#### 4.5 The website domains

We expected that the major genres of websites researched in the literature would be university websites, religious websites and government websites. This proposition turned out to be partly true, as there was a great variety in the studied website domains. Table 7 provides a list of domains that have been studied and gives examples of the focus of the articles in each particular domain of websites.

**Table 7:** Domains of websites in Articles

| <i>Domain</i>         |   | <i>Focus</i>   |
|-----------------------|---|--|
| Academic websites     | P3, P4, P6, P9, P14, P20, P28, P42, P50, P55, P59 | Children service, usability evaluation, students learning  |
| Databases             | P12, P46  | Information retrieval                                      |
| E-commerce            | P11, P17, P24, P33, P39, P48, P53, P56            | Evaluation, trust, intention                               |
| E-government websites | P23, P25, P26, P45                                | Learning, e-services accessibility evaluation, performance |
| Industry websites     | P8, P18   | Perceived usability  |
| Mobile websites       | P19, P34  | Mobile social networking, mobile commerce                  |
| Product and Services  | P31, P36, P38, P43                                | E-services, company services, case study                   |
| Public Services       | P5, P16, P47, P60                                 | Community websites, public libraries                       |
| Tourism Websites      | P10, P22, P29, P44, P52,                          | Navigation and evaluation, performance                     |

|                  |   |   |
|------------------|---|---|
|                  | P54   | and perception  |
| Websites/systems | P30, P40, P41, P49, P51<br>P57, P58         | Web applications, web systems, web base systems   |
| Other domains    | P1, P2, P7, P13, P15, P27,<br>P32, P35, P37 | Blogs, community based websites, adaptive websites, web systems, English learning websites, local websites, web based systems |

From Table 7 we can see that the website domains studied included a broad variety of domains such as academic websites, e-government websites, e-portfolios, library websites and tourism websites. In terms of the number of studies, the academic domain and the tourism and e-commerce domains were the most studied.

Studies on academic website usability emphasized the enhancement of students' learning and of user experience for academic library websites. There was not much emphasis on healthcare and only two articles talked about healthcare websites and services. The e-commerce websites clearly focused more on trust, user purchase intention and the evaluation of e-commerce websites for end user satisfaction. For tourism and hotel research, studies from Hong Kong focused on tourism and hotel websites' usability. Within this, emphasis was placed on travellers' perceptions of the functionality of hotel websites as well as general usability. The e-portfolio and e-services studies stressed databases and information retrieval. E-government website studies emphasized evaluation of the quality of government websites their accessibility. The studies also discussed the enhancement of learning opportunities though e-government websites. E-commerce (19%, 5 of 27) and academic websites (19%, 4 of 27) was the second and third most studied domains. The other studies focused on usability of websites for the elderly and customer loyalty.

From previous research it was expected that a significant number of articles would focus on the usability of religious websites, particularly in articles from Muslim majority countries (that is, Pakistan, Indonesia, Oman, and Saudi Arabia) and with large Muslim populations (India). We expected this because religion is an important part of the social system and structure in these countries. However, of the 60 articles investigated here only one study (P2) analyzed religion as a variable in any depth. Thus there was not a significant body of articles related to religious identity and evaluation of religious websites. For studies of the topic that are located outside the articles discussed here, see (Al-shamaileh et al., 2011; Murni & Abu Osman, 2011).

#### **4.6 The focus on cultural markers**

We expected that a large proportion of the articles would focus on cultural markers, as it had been shown that users from different cultures preferred different modes of cultural markers (Sun, 2001). There were a number of studies that looked into the issue of cultural markers (11%, 7 of 60) in different cultures. Some of the studies found significant differences in website usability when culturally appropriate markers were used, while other studies were less definite, suggesting that cultural markers were "possibly preferred" in a particular culture. The studies of cultural markers emphasized language issues (P2), perception and animation (P3, P22), fonts (P15), icons and

images (P33, P56) and information design (P36). The studies of cultural markers emphasized that better cultural marker results increased the usability of web pages and reduced the complexity and mental load of users. However most of the studies did not emphasize the analysis of icon, images, fonts, etc., despite these feature being considered major points of interest in cultural markers theory. The research methods used in the articles

It could be expected that the investigated studies would tend toward more conventional quantitative methods (for example questionnaires), rather than qualitative methods (for example open interviews). This proposition was true, as the analysis of the 60 articles showed that a large proportion of the articles (65%, 39 of 60) applied quantitative methods when conducting their studies of website usability. Few studies (12%, 7 of 60) leveraged qualitative methods. A further few articles (16%, 10 of 60) used a mixed methods approach (Creswell, 2009). While other articles emphasized methods and theory, some articles (8%, 5 of 60) directly expounded a model and framework for website usability.

Besides looking at the quantitative/qualitative distinction, one way to characterise a body of research is to divide articles according to whether they are mainly theoretical research, field studies, experiments, ethnographical observations, interviews, surveys or other types. For the set of articles about studied here, it turned out that a large proportion (46%, 28 of 60) concerned experimental research. The activities in the experiments with website usability involved measuring task performance, assessing web pages according to Likert scales after task, testing iconic identifiability (P33), information seeking tasks (P9, P11, P24, P37, P47), and time and click counts for tasks (P27, P47, P51, P58).

Another section of the studies used surveys (20%, 12 of 60) to understand Asian users' perceptions of website usability. Questionnaires were posted on the websites or collected individually from users of the websites. The survey articles also included those articles that examined a list of websites and selected a sample of websites for usability evaluation in a particular domain. Ethnographic studies and interviews were least used, with only three articles using interviews for website evaluation (P19, P29, and P30).

#### **4.7 The user representation**

In any usability study, it is important to recruit users who are representative of the population and area of study. It could thus be expected that study participants in the investigated articles would represent the domains for which the usability studies were conducted. We expected that a reasonable number of studies would have rural users as study participants. The reason for this was because governments and organizations in many Asian countries are trying to provide services not only to urban communities but also to the substantial population that lives in rural areas. However, in the investigated articles, there were no studies with rural users as the participants, and there were no studies of websites in rural settings. A majority of the studies (62%, 18 of 29) used college and university students and lecturers for data collection. The students' type and characteristics varied in some studies. Two of the studies used blind students (P16, P32), one study used 5<sup>th</sup> grade students (P47) and two studies used college students (P20, P24). Some studies (14%, 4 of 29) did not

provide sufficient details to determine the nature of the subjects of the study. The remaining articles (24%, 7 of 29), which did not use students, used participants that were appropriate to their case studies: hotel guests and travel industry professionals (P29), IT/IS professionals (P35, P56), mobile users (P19, P34), senior citizens (P13), and usability professionals (P36).

In the investigated articles, the variation depended on the domain of research and experimental design and activities. The results showed that academic websites were studied many times in the usability studies of a single domain of website, but the ratio of university students was higher than the ratio of academic websites as domain. The use of representative user groups was lower in other domains of websites.

The number of participants for experiments varied from 3 to 54 participants (P13, P16, P19, P21, P22, P24, P30, P32, P33, P36, P47 P56, P58, and P59). Articles using survey data recruited between 77 and 250 participants (P20, P23, P29, P34, P37, P39, P44, P48). Two of the studies (P16, P32) used blind users (3 and 6 users) in their experiments. Three users were used to test a navigational tool by asking them to find information on the company website (P58).

## **5 Discussion**

The analysis of the selected 60 articles on website usability in Asia published between 2001 and 2011 showed an increase in publishing on website usability topics. While it is not possible to conclude on the weak tendency, increasing research on HCI in Asia published by researchers within the region, may help to assess if in fact usability is not universal (Frandsen-Thorlacius et al., 2009) and whether the culturally-embedded meaning of objects has been insufficiently explained by current theories of website usability (Smith & Yetim, 2004). In the following we discuss the key findings from our analysis.

### ***5.1 Which countries produced HCI research on website usability in Asia?***

A large part of the articles on website usability in Asia originated in China, Japan, Malaysia and Taiwan, while a fewer articles retrieved from South Korea, and Malaysia. Somewhat surprisingly, despite a significant and promising ICT industry in India (Smith, Joshi et al. 2007), there were not many articles identified from that country. When research on website usability is compared to website usability research in general another picture emerges. Table 8 shows the top five countries producing website usability articles in Asia relative to website usability papers in general. Clearly, much research on website usability is conducted in the United States. Whereas China and Japan are top research locations for website usability in Asia, they do not feature in the top five locations for website usability research in general.

**Table 8:** A comparison of articles on *website usability* in Asia with the general spread of articles in Scopus 2001-2011

| <i>Asia</i>                               | <i>Proportion</i> | <i>In General</i> | <i>Proportion</i> |
|---|-------------------|-------------------|-------------------|
| China                                     | 7 of 31 or 22%    | United States     | 86 of 289 or 30%  |
| Japan                                     | 7 of 31 or 22%    | United Kingdom    | 23 of 289 or 8%   |
| Malaysia                                  | 5 of 31 or 16%    | Spain             | 19 of 289 or 7%   |
| Taiwan                                    | 4 of 31 or 12%    | Canada            | 17 of 289 or 6%   |
| Malaysia,<br>South Korea,<br>Jordan, Iran | 2 of 31 or 6%     | Australia         | 13 of 289 or 5%   |

## 5.2 Religious websites as a research topic

While we were excited about the possibility of identify a body of research on religion and websites in Asia, the analysis in this article revealed only one study analyzing religion in any depth. The propositions relied on recent research on the use of websites for religious purposes in particular in Muslim majority countries (Murni & Abu Osman, 2011). However, it has also been suggested that people that belong to other religious groups, for example Christians, with strong religious feelings may have needs that require new definitions and extensions of existing website usability concepts (Al-shamaileh et al., 2011). For example, their concept of usability may focus more on content and authenticity. We would therefore still expect to see future studies with focus on religious websites and religious domain, both within and outside Asia.

## 5.3 Who and Where

The findings in this paper show that undergraduate and graduate students are commonly recruited for studies of website usability in Asia. While using Hofstede's and similar cultural theories as a frame of reference which outlines that culture is carried around by the individuals' minds, rather than emerging from practice in context. In this sense, it can be argued that it is acceptable to recruit university students as representative of their larger national culture as research shows that users are different in different cultures (Day & Evers, 2001; Callahan, 2005; Marcus & Hamoodi, 2009). In some cultures users prefer the reading which has a fundamental of reading from right to left while others always read which has fundamental of reading from left to right. Thus it can be argued if a design fits with a local group of students, it will also fit with other people from same society, ethnic group and country (Isa et al., 2009), that is, that there can be a 'cultural fit' (Clemmensen, 2011). However, in the investigated articles, there were no studies with rural users as the participants, and there were no studies of websites in rural settings. Thus only one category of users was considered across Asian countries.

In contrast to the strong focus on only one kind of user, the finding of this study was that a broad variety of domains were studied, particularly academic websites, e-government websites, e-portfolios, library websites and tourism websites (with academic websites being the most frequent). Due to the focus of the study on website usability, half of the articles consisted of usability analyses

of websites. Thus it appears that it may be sufficient as a start to use students for study, given the substantial differences in language usage between different cultures and their implications for the understanding of usability of websites.

Participants clearly play a critical role in the results of any study. However, the issue of researcher perspective, background and potential bias should not be ignored. Relative to culture, this contextual influence of the researchers and usability evaluators on the results of studies has been shown to be even greater in context-dependent China, compared to context-independent Denmark (Shi, 2010).

#### **5.4 Coding, analysis and interpretation of data**

Studies of cultural markers provided an impression that understanding cultural markers in a culture can help in implementing it for a similar audience. However, implementing cultural markers for similar user groups in another culture may not be a very good way to approach the issue. Instead, the representations associated with a culture such as the use of a certain set of colours, fonts, and information design should be identified, applied and tested with a representative audience before any generalisations are made.

Authors mention cultural markers as being of key interest to website usability studies in Asia. The further discovery in the results above shows that typographical attributes of cultural markers are considered central to this. In cultural markers studies, typographical guidelines used for presenting the English alphabet cannot be applied directly to Asian languages such as Korean characters (Hangul), for instance.

On the other hand, studies of cultural markers focused on users' preferences of pictures, icons, shapes, colours, texts and tones to judge whether the site targets users or not. This is critical for designers to consider when looking for standardized icons that convey a similar meaning across locations and cultures. Crucially, they should also consider meanings that the icons may convey to user groups others than the target audience.

In this study we did not find, contrary to our propositions, that most studies used Hofstede's cultural dimensions to conceptualize what is "Asia-specific" for website usability. This may be because Hofstede's model of national culture – which assumes that cultural differences are in some way aligned with the territorial boundaries of the nation state – is problematic in various aspects (Myers & Tan, 2003). Other approaches have been proposed that focus more on empirical data collection in order to define a concept of cultural usability (Clemmensen, 2011) or that focus on cultural value criteria (Kurosu, 2008). This study found that many cognitive and psychological theories were used to study website usability in Asia, though these theories hardly could be categorized as cultural theories.

#### **5.5 Are there topical gaps in website usability research in Asia?**

In order to identify gaps in the literature, our findings on website usability in Asia can be compared to similar findings from Europe. We conducted an additional review of the studied domains in

European countries. This overview helped us to understand the studied domains in developed countries and to compare it with studied domains in Asian countries. The keyword ‘website usability’ was used in the ‘Scopus’ database. We used ‘Scopus’ for an overview because ‘Scopus’ returned a maximal number of articles. A total of 27 articles were published between 2001 and 2011 in European countries such as Switzerland, US, Germany, Austria. Some of the studied articles (26%, 7 of 27) in developed countries focused on the healthcare domain. Topics of articles in this domain focused on the usability of medicine websites, brain injury rehabilitation service websites, health promotion websites, surgery program websites and nutrition websites. In contrast, in Asia the studies concerned different domains of interest, such as tourism, and different topics of study, such as mental stress. In summary, the website usability research in Asia does not suffer from gaps, but rather emphasizes different topics compared to website usability research in Europe.

## **5.6 Overview of articles with English Summary**

The articles analyzed in this paper were only selected if they were written and published in English. However, due to the nature of diverse culture and multi-lingual society in the context of Asia, some relevant and related website usability studies may well have been published in local Asian language publications (e.g. Chinese, Japanese, Korean). It is thus a limitation of this study that we only examined English-language articles. To test this, we performed a search on website usability in Chinese-language journals and looked for articles with an English summary. The articles were mainly written in Chinese. Seven papers (see appendix A) were identified by a research assistant from the Chinese academy of Science as good examples of Chinese-language research on website usability and several of the papers were indeed about Asia-specific topics. One paper was about social network groups from an ‘Otaku’ (excessive fan behaviour) perspective (Li & Yin, 2011). Another compared the search effectiveness of Google and Baidu which is Chinese search engine, and found that Google was better in content accuracy while worse in contents accessibility and overall less effective for searches. There were also significant differences between the two search engines in user experience patterns. Users’ perception of the effectiveness of Google was mainly derived from content accuracy; while their effectiveness perception of Baidu was derived from both accuracy and accessibility (Liuzi et al., 2010). A third paper was a design method paper that proposed “the clicking read with mouse” as a new website user experience evaluation method combining “thinking aloud” with “point reading” (Zhang, 2011). The other four papers were about general user experience: digital network designers’ duty to think beyond the design of the interface itself and to rethink the meaning of design when doing website design (Ni, 2008), user experience design with web design as an example (He & Liu, 2010), applying Maslow's hierarchy of needs to HCI to argue that web design may satisfy users' experience requirement at a higher level (Wei & Gong, 2011), and arguing that user experience design should focus on users' cognition using Donald Norman’s model (Li, 2010). It remains difficult, however, to select many articles from other languages with an English summary, because in order to perform a decent review, we would have to be able to read not only the abstract, but also the entire contents of the article.

## **5.7 Limitations**

In this work, we used the two key words ‘website’ and ‘usability’ to search in academic databases of literature. We did not consider those articles that used different key words to address website usability (including typographical differences such as ‘web site’ and ‘web-site’). We also did not consider using broader terms that imply the use of the web, such as e-commerce, or e-government. Another approach we could have used was to also use the names of specific countries. A script could have been written to search for appropriate papers, which contained the names of the country and also the word “usability” and “web” or “website”. However, using more than one keyword would return many articles which were not directly relevant to the study

Finally, a possible contributing factor to the lack of articles dealing with religious aspects of website usability in Asia could be that the keywords used when searching the academic databases did not directly focus on religious websites or religious users.

## **6 CONCLUSION**

The study presented here indicates that the number of publications on website usability in Asia has increased in the studied period of 2001 to 2011. This suggests an increasing interest among researchers in website usability in Asia. There were several gaps in the literature. Website usability research in domain of healthcare was limited, for instance, and few studies employed qualitative measures in their evaluations. The propositions that China would be a major source of research held true. The result of the review showed that much of the research work on website usability in Asia was conducted in Japan, Taiwan and China. In contrast, little work had been conducted in Western Asia. Quantitative methods were preferred to examine website usability, although some studies used both qualitative and quantitative approaches to measuring website usability and focused on user involvement. The focus of website usability for tourism websites was one surprising finding in this literature review. Many of the articles focused on website usability of a single domain of websites. The articles did not use Hofstede too frequently. On the contrary, there were more cognitive and psychological theories used to study website usability in Asia, rather than cultural theories. In general, the use of theory was limited in the articles. Although there is an increasing focus across the globe on the creation of indigenous and local language content, there is not much indication towards localisation of contents.

### **6.1 Implications**

This research adds to the small but important research literature in HCI on website usability in Asia by providing an overview of the current state of the literature in Asia. The implication for a theory of “website usability in Asia” is that the existing theories for website usability should be augmented and re-interpreted in the Asian context. As a first step, we recommend that authors of research papers explicitly state which theories they use to study their topic, as this information was frequently missing. Furthermore, the study of website usability in Asia should take into account

which website domains have been examined, and perhaps expand this to include not only government and academic websites as there are certainly under-explored areas.

Future literature reviews of this subject may include conference papers in all databases to better understand the diverse nature of research on website usability research in Asia. Practitioners may learn from this study that there is in fact an emerging and growing literature on website usability in Asia, and that at least some of this literature deals with Asia-specific issues of website usability.

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## References

- Al-shamaileh, O., Sutcliffe, A., & De Angeli, A. (2011). The effect of religious identity on user judgment of website quality. Human-Computer Interaction–INTERACT 2011: 620-623.
- Bargas-Avila, J. A. & Hornbaek, K. (2011). Old wine in new bottles or novel challenges: a critical analysis of empirical studies of user experience. Proceedings of the 2011 annual conference on Human factors in computing systems: 2127-2136
- Blomqvist, K., Hurmelinna-Laukkanen, P., Nummela, N., & Saarenketo, S. (2008). The role of trust and contracts in the internationalization of technology-intensive Born Globals. Journal of Engineering and Technology Management, 25(1-2), 123-135.
- Cairns, P. (2007). HCI... not as it should be: inferential statistics in HCI research. Paper presented at the Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI...but not as we know it - Volume 1, University of Lancaster, United Kingdom.
- Callahan, E. (2004). Interface design and culture. Annual Review of Information Science and Technology 2005, Volume 39: 255-310
- Callahan, E. (2005). Cultural similarities and differences in the design of university Web sites. Journal of computer mediated communication - Electronic Edition 11(1): 239-273.
- Choong, Y.-Y. & G. Salvendy (1997). Design of Computer Interfaces for the Chinese Population. HCI (1) 1997: 173-176.
- Clemmensen, T. (2010). A framework for thinking about the maturity of cultural usability. In E. G. Blanchard & D. Allard (Eds.), Handbook of Research on Culturally-Aware Information Technology: Perspectives and Models. Hershey, PA: IGI Global.
- Clemmensen, T. and K. Roeser (2010). An overview of a decade of journal publications about culture and human-computer Interaction (HCI). HWID 2009 Human Work Interaction Design: Usability in Social, Cultural and Organizational Contexts. D. S. Katre, R. Orngreen, P. G. Yammiyavar and T. Clemmensen. Pune, India, October 7-8, 2009, Springer. 316: 98-112.
- Clemmensen, T. (2011). "Usability problem identification in culturally diverse settings." Information Systems Journal, 22(2), 151-175.
- Creswell, J. (2009). Research design: Qualitative, quantitative, and mixed methods approaches: Sage Publications, Inc.

- Day, D. and V. Evers (2001). Website Localisation, the good, the bad, and the ugly. International Workshop on Internationalisation of Products and Systems. , Milton Keynes, England.
- Faiola, A. and S. A. Matei (2005). Cultural Cognitive Style and Web Design: Beyond a Behavioral Inquiry into Computer-Mediated Communication. Journal of Computer-Mediated Communication 11(1): 375-394.
- Frandsen-Thorlacius, O., K. Hornbaek, et al. (2009). Non-Universal Usability? A Survey of How Usability is Understood by Chinese and Danish Users. Proceedings of the 27th Annual CHI Conference on Human Factors in Computing Systems, Vols 1-4: 41-50.
- Hofstede, G. (1980). Culture's Consequence: Comparing Values, Behaviours, Institutions and Organizations Across Nations. Thousand Oaks, CA, Sage Publications Inc
- Hofstede, G. J. (2005). Cultures and organizations: Software of the mind, McGraw-Hill Publishing Co.
- Isa, W. A. W. M., Noor, N. L. M., & Mehad, S. (2009). Culture Design of Information Architecture for B2C E-Commerce Websites. Paper presented at the Proceedings of the 1st International Conference on Human Centered Design: Held as Part of HCI International 2009, San Diego, CA. 805-814
- Joinson, A. N. (2008). Looking at, looking up or keeping up with people?: motives and use of facebook. Paper presented at the Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems, Florence, Italy. 1027-1036
- Juric, R., Kim, I., & Kuljis, J. (2003). Cross cultural web design: an experiences of developing Uk and Korean cultural markers. Paper presented at the 25th Int. Conf. Information Technology Interfaces IT, Cavtat, Croatia. 309-313.
- Kühnen, U., Hannover, B., Roeder, U., Shah, A. A., Schubert, B., Upmeyer, A., et al. (2001). Cross-Cultural Variations in Identifying Embedded Figures Comparisons from the United States, Germany, Russia, and Malaysia. Journal of Cross-Cultural Psychology, 32(3), 366-372.
- Kurosu, M. (2008). Usability and culture as two of the value criteria for evaluation the artifact. Cultural Usability and Human Work Interaction Design – techniques that connects: Proceedings from NordiCHI 2008 Workshop Sunday October 19, 2008, Lund, Sweden. T. Clemmensen. Lund, Sweden, Department of Informatics, Copenhagen Business School, 2008. (Working Paper; 01-2008). 50-56.
- Kurosu, M., Kobayashi, T., Yoshitake, R., Takahashi, H., Urokohara, H., & Sato, D. (2004). Trends in Usability Research and Activities in Japan. International Journal of Human-Computer Interaction, 17(1), 103-124
- Marcus, A. and E. W. Gould (2000). "Crosscurrents: cultural dimensions and global Web user-interface design." Interactions 7(4): 32 - 46
- Marcus, A. and S. Hamoodi (2009). The Impact of Culture on the Design of Arabic Websites. Internationalization, Design and Global Development, Springer Berlin: 386-394.
- Miyamoto, Y., Nisbett, R. E., & Masuda, T. (2006). Culture and the physical environment - Holistic versus analytic perceptual affordances. Psychological Science, 17(2), 113-119.
- Murni, M., Mansur and M. T. Abu Osman (2011). Proposing a Working Definition and Framework to Evaluate Islamic Website. The Int. Workshop on Internationalisation of Products and Systems. Kuching, Malaysia.
- Myers, M. D. and F. B. Tan (2003). Beyond models of national culture in information systems research. Journal of Global Information Management (JGIM), 10(1), 24-32.
- Nawaz, A., & Clemmensen, T. (2010). Using card sorting to explore collectivism in students' approaches on a university website. Paper presented in 11<sup>th</sup> Danish HCI Research Symposium. Copenhagen, Denmark. 15-18

- Nawaz, A., Clemmensen, T., & Hertzum, M. (2011). Information Classification on University Websites: A Cross-Country Card Sort Study. Paper presented at the Information Systems Research Seminar in Scandinavia ( IRIS), Turku: 528-542.
- Nantel, J. and E. Glaser (2008). The impact of language and culture on perceived website usability. Journal of Engineering and Technology Management 25(1-2): 112-122.
- Nielsen, J. (1994). "Report from a 1994 Web usability study." Jacob Nielsen's Alertbox.
- Nisbett, R. E. (2003). The geography of thought: Why we think the way we do, New York: Free Press.
- Oshlyansky, L. (2007). Cultural Models in HCI: Hofstede, Affordance and Technology Acceptance PhD, The University of Wales, Swansea University.
- Pingdom. (2010). The incredible growth of the Internet since 2000 Retrieved 04, June, 2012, from <http://royal.pingdom.com/2010/10/22/incredible-growth-of-the-internet-since-2000/>
- Sheppard, C., & Scholtz, J. (1999). The Effects of Cultural Markers on Web Site Use. Paper presented at the 5th Conference on Human Factors & the Web.
- Shi, Q. (2010). An Empirical Study of Thinking Aloud Usability Testing from a Cultural Perspective. PhD thesis, PhD Series, no. 30.2010, Copenhagen Business School (CBS), Copenhagen, Denmark.
- Smith, A., A. Joshi, et al. (2007). Institutionalizing HCI in Asia. Proceedings of the 11th IFIP TC 13 international conference on Human-computer interaction - Volume Part II. Rio de Janeiro, Brazil, Springer-Verlag: 85-99.
- Smith, A. and F. Yetim (2004). Global human-computer systems: Cultural determinants of usability. Editorial. Interacting with Computers 16(1): 1-5
- Smith, A., Dunckley, L., French, T., Minocha, S., & Chang, Y. (2004). A process model for developing usable cross-cultural websites. Interacting with Computers, 16(1), 63-91.
- Sun, H. (2001). Building a culturally-competent corporate web site: an exploratory study of cultural markers in multilingual web design. Proceedings of the 19th annual international conference on Computer documentation: 95-102.
- Sun, H. (2001). Building a culturally-competent corporate web site: an exploratory study of cultural markers in multilingual web design, ACM New York, NY, USA.
- Yeo, A. W., Chiu, P. C., Lim, T. Y., Tan, P. P., Lim, T., & Hussein, I. (2011). Usability in Malaysia. Global Usability, 211-222
- Yeo, A. W. (1998). Cultural Effects in Usability Assessment. Paper presented at the CHI 98 conference summary on Human factors in computing systems, California, United States. 74-75.

## APPENDIX A

**Table A1:** List of articles used for analysis

| <i>Code</i> | <i>Article</i>   |
|-------------|--|
| P1          | Morita, T., Narimatsu, H., Matsumura, T., Kodama, Y., Hori, A., Kishi, Y., Kami, M. (2007). A study of cancer information for cancer patients on the internet. <i>International Journal of Clinical Oncology</i> , 12(6), 440-447.   |
| P2          | Talukder, M., & Yeow, P. H. P. (2007). A comparative study of virtual communities in Bangladesh and the USA. <i>Journal of Computer Information Systems</i> , 47(4), 82-90.  |
| P3          | Hsiao, S. W., & Chou, J. R. (2006). A Gestalt-like perceptual measure for home page design using a fuzzy entropy approach. <i>International Journal of Human-Computer Studies</i> , 64(2), 137-156.  |
| P4          | Genc, Z., & Tinmaz, H. (2010). A reflection of preservice teachers on e-portfolio assessment. <i>Procedia - Social and Behavioral Sciences</i> , 9(0), 1504-1508.  |
| P5          | Noh, Y. (2011). A study on metadata elements for web-based reference resources system developed through usability testing. <i>Library Hi Tech</i> , 29(2), 242-265.  |
| P6          | Kanazawa, M., & Maruyama, Y. (2008). An evaluation of public library websites: Describing children's services in Japan. <i>Public Library Quarterly</i> , 27(4), 291-310.  |
| P7          | Lee, J.-H., & Shiu, W.K. (2004). An adaptive website system to improve efficiency with web mining techniques. <i>Advanced Engineering Informatics</i> , 18(3), 129-142.  |
| P8          | Nathan, R. J., & Yeow, P. H. P. (2009). An empirical study of factors affecting the perceived usability of websites for student Internet users. <i>Univers. Access Inf. Soc.</i> , 8(3), 165-184.  |
| P9          | Alkindi, S., & Bouazza, A. (2010). An evaluation study of the navigation and search systems on two academic websites and Google. <i>The International Information &amp;amp; Library Review</i> , 42(1), 50-61.   |
| P10         | Kasli, M., & Avcikurt, C. (2008). An investigation to evaluate the websites of tourism departments of universities in Turkey. <i>Journal of Hospitality Leisure Sport &amp; Tourism Education</i> , 7(2), 77-92.   |
| P11         | Takagi, H., Saito, S., Fukuda, K., & Asakawa, C. (2007). Analysis of navigability of Web applications for improving blind usability. <i>ACM Transactions on Computer-Human Interaction</i> , 14(3).  |
| P12         | Endo, T., Ueno, K., Yonezawa, K., Mineta, K., Hotta, K., Satou, Y. Inaba, K. (2011). CIPRO 2.5: Ciona intestinalis protein database, a unique integrated repository of large-scale omics data, bioinformatic analyses and curated annotation, with user rating and reviewing functionality. <i>Nucleic Acids Research</i> , 39(SUPPL. 1), D807-D814. |
| P13         | Hara, Y., & Kashimura, K. (2010). Cognitive aging and rich internet applications: Usability problems of Ajax based on the empirical study of older adults. <i>Japanese Psychological Research</i> , 52(3), 216-226.  |
| P14         | Şengel, E., & Öncü, S. (2010). Conducting preliminary steps to usability testing: investigating the website of Uludağ University. <i>Procedia - Social and Behavioral Sciences</i> , 2(2), 890-894.  |
| P15         | Rohae, M. (2003). Conjoint analysis as a new methodology for Korean typography guideline in Web environment. <i>International journal of industrial ergonomics</i> ,   |

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- 32(5), 341-348.
- P16 Iizuka, J., Okamoto, A., Horiuchi, Y., & Ichikawa, A. (2009). *Considerations of Efficiency and Mental Stress of Search Tasks on Websites by Blind Persons*. Paper presented at the Proceedings of the 5th International Conference on Universal Access in Human-Computer Interaction. Part III: Applications and Services, San Diego, CA.
- P17 Guo, Y. N., Salvendy, G., & Proctor, R. W. (2010). Content information desired by Chinese users for effective use of information appliances. *Computers in Human Behavior, 26*(6), 1685-1693.
- P18 Nathan, R. J., & Yeow, P. H. (2011). Crucial web usability factors of 36 industries for students: a large-scale empirical study. *11*(2), 151-180.
- P19 Rhee, Y., Lee, J., & Chang, I. (2010). Designing mobile social networking service through UCD process: Lifediary. *International Journal of Human-Computer Interaction, 26*(11-12), 1052-1076.
- P20 Liu, G.-Z., Liu, Z.-H., & Hwang, G.-J. (2011). Developing multi-dimensional evaluation criteria for English learning websites with university students and professors. *Computers & Education, 56*(1), 65-79.
- P21 Bae, J., Wolpin, S., Kim, E., Lee, S., Yoon, S., & An, K. (2009). Development of a user-centered health information service system for depressive symptom management. *Nursing & Health Sciences, 11*(2), 185-193.
- P22 Cheung, C., Hu, T., & Law, R. (2009). Does the usability experienced performance of travel websites in China meet users' expectation? *Asia Pacific Journal of Tourism Research, 14*(3), 255-266.
- P23 Huang, J. H., & Shyu, S. H. P. (2008). E-government web site enhancement opportunities: a learning perspective. *Electronic Library, 26*(4), 545-560.
- P24 Jiang, Z. H., Chan, J., Tan, B. C. Y., & Chua, W. S. (2010). Effects of Interactivity on Website Involvement and Purchase Intention. *Journal of the Association for Information Systems, 11*(1), 34-59.
- P25 Abu-Shanab, E. A., & Baker, A. N. A. (2011). Evaluating Jordan's e-government website: A case study. *Electronic Government, 8*(4), 271-289.
- P26 Hong, S., Katerattanakul, P., & Joo, S. J. (2008). Evaluating government website accessibility: A comparative study. *International Journal of Information Technology & Decision Making, 7*(3), 491-515.
- P27 Kitajima, M., Kariya, N., Takagi, H., & Zhang, Y. (2005). Evaluation of website usability using Markov chains and latent semantic analysis. *IEICE Transactions on Communications, E88-B*(4), 1467-1475.
- P28 Teoh, K. K., Ong, T. S., Lim, P. W., Liong, R. P. Y., & Yap, C. Y. (2009). Explorations on web usability. *American Journal of Applied Sciences, 6*(3), 424-429.
- P29 Yeung, T. A., & Law, R. (2004). Extending the modified heuristic usability evaluation technique to chain and independent hotel websites. *International Journal of Hospitality Management, 23*(3), 307-313.
- P30 Chun-Cheng, H. (2011). Factors affecting webpage's visual interface design and style. *Procedia Computer Science, 3*(0), 1315-1320.
- P31 Abedin, B., & Sohrabi, B. (2009). Graph theory application and web page ranking for website link structure improvement. *Behaviour and Information Technology, 28*(1), 63-72.
- P32 Kim, D.-j., & Lim, Y.-k. (2011). *Handscope: enabling blind people to experience statistical graphics on websites through haptics*. Paper presented at the
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- Proceedings of the 2011 annual conference on Human factors in computing systems, Vancouver, BC, Canada.
- P33 Cheng, H. I., & Patterson, P. E. (2007). Iconic hyperlinks on e-commerce websites. *Applied Ergonomics*, 38(1), 65-69.
- P34 Li, Y. M., & Yeh, Y. S. (2010). Increasing trust in mobile commerce through design aesthetics. *Computers in Human Behavior*, 26(4), 673-684.
- P35 Yu-Hui, T. (2008). Information system professionals' knowledge and application gaps toward Web design guidelines. *Computers in Human Behavior*, 24(3), 956-968.
- P36 Rau, P. L. P., & Liang, S. F. M. (2003). Internationalization and localization: Evaluating and testing a Website for Asian users. *Ergonomics*, 46(1-3), 255-270.
- P37 Liao, Y. W., & Wang, Y. S. (2011). Investigating the influence of the landscape preference of blogs, user satisfactory and behavioral intention. *Journal of Convergence Information Technology*, 6(10), 377-384.
- P38 Yeh, D. M., Tsai, R., Sun, P. C., & Lee, J. W. (2008). Linear regression models for assessing the ranking of web sites based on average numbers of visits. *Journal of Information Science and Engineering*, 24(2), 585-599.
- P39 Kim, M. S., & Ahn, J. H. (2007). Management of trust in the e-marketplace: The role of the buyer's experience in building trust. *Journal of Information Technology*, 22(2), 119-132.
- P40 Ahmad, R., Li, Z., & Azam, F. (2006). *Measuring Navigational Burden*. Paper presented at the Proceedings of the Fourth International Conference on Software Engineering Research, Management and Applications.
- P41 Zhou, Y., Leung, H., & Winoto, P. (2007). MNav: A Markov model-based web site navigability measure. *IEEE Transactions on Software Engineering*, 33(12), 869-890.
- P42 Chui, C.-k., & Li, C.-h. (2005). *Navigational Structure Mining for Usability Analysis*. Paper presented at the Proceedings of the 2005 IEEE International Conference on e-Technology, e-Commerce and e-Service (EEE'05) on e-Technology, e-Commerce and e-Service.
- P43 Segawa, S., Sugimura, M., & Ishigaki, K. (2005). New web-usability evaluation method: Scenario-based walkthrough. *Fujitsu Scientific and Technical Journal*, 41(1), 105-114.
- P44 Law, R., Qi, S., & Leung, B. (2008). Perceptions of functionality and usability on travel websites: The case of chinese travelers. *Asia Pacific Journal of Tourism Research*, 13(4), 435-445.
- P45 Dominic, P. D. D., Jati, H., & Kannabiran, G. (2010). Performance evaluation on quality of Asian e-government websites - An AHP approach. *International Journal of Business Information Systems*, 6(2), 219-239.
- P46 Li, D., Fu, Y., Sun, R., Ling, C. X., Wei, Y., Zhou, H. Gao, W. (2005). pFind: a novel database-searching software system for automated peptide and protein identification via tandem mass spectrometry. *Bioinformatics*, 21(13), 3049-3050.
- P47 Chen, C. H., Wu, F. G., Rau, P. L. P., & Hung, Y. H. (2004). Preferences of young children regarding interface layouts in child community web sites. *Interacting with computers*, 16(2), 311-330.
- P48 Zhang, Y., Fang, Y., Wei, K.-K., Ramsey, E., McCole, P., & Chen, H. (2011). Repurchase intention in B2C e-commerce - A relationship quality perspective. *Information & Management*, 48(6), 192-200.
- P49 Sugisaki, E., Seah, H. S., Kyota, F., & Nakajima, M. (2009). *Simulation-based in-*
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- between creation for CACAni system.* Paper presented at the ACM SIGGRAPH ASIA 2009 Sketches, Yokohama, Japan.
- P50 Alsmadi, I. (2010). The automatic evaluation of website metrics and state. *International Journal of Web-Based Learning and Teaching Technologies*, 5(4), 1-17.
- P51 Ahmad, R., Li, Z., & Azam, F. (2006). *Towards Generic User Interface for Web Based Systems Serving Similar Functions.* Paper presented at the Proceedings of the Fourth International Conference on Software Engineering Research, Management and Applications.
- P52 Law, R., & Ngai, C. (2005). Usability of travel websites: A case study of the perceptions of Hong Kong travelers. *Journal of Hospitality and Leisure Marketing*, 13(2), 19-31.
- P53 Li, F., & Li, Y. (2011). Usability evaluation of e-commerce on B2C websites in China. *Procedia Engineering*, 15(0), 5299-5304.
- P54 Qi, S. S., Law, R., & Buhalis, D. (2008). USABILITY OF CHINESE DESTINATION MANAGEMENT ORGANIZATION WEBSITES. *Journal of Travel & Tourism Marketing*, 25(2), 182-198.
- P55 Altin, R., Mustaf, Bektik, Ek, N., Koray, C., Canbek, m., Routh, C. R. (2009). *Use of intuitive tools to enhance student learning and user experience.* Paper presented at the Proceedings of the 14th annual ACM SIGCSE conference on Innovation and technology in computer science education, Paris, France.
- P56 Marcus, A., & Alexander, C. (2007). *User validation of cultural dimensions of a website design.* Paper presented at the Proceedings of the 2nd international conference on Usability and internationalization, Beijing, China.
- P57 Li, C.-h., & Kit, C.-c. (2005). *Web Structure Mining for Usability Analysis.* Paper presented at the Proceedings of the 2005 IEEE/WIC/ACM International Conference on Web Intelligence.
- P58 Nakamichi, N., Sakai, M., Shima, K., Hu, J., & Matsumoto, K.-i. (2007). WebTracer: A new web usability evaluation environment using gazing point information. *Electronic Commerce Research and Applications*, 6(1), 63-73.
- P59 Kiura, M., Ohira, M., & Matsumoto, K.-I. (2009). *Webjig: An Automated User Data Collection System for Website Usability Evaluation.* Paper presented at the Proceedings of the 13th International Conference on Human-Computer Interaction. Part I: New Trends, San Diego, CA.
- P60 Qahri Saremi, H., Abedin, B., & Meimand Kermani, A. (2008). Website structure improvement: Quadratic assignment problem approach and ant colony meta-heuristic technique. *Applied Mathematics and Computation*, 195(1), 285-298.
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## APPENDIX B

**Table B1:** List of Chinese articles used for analysis

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| <i>Code</i> | <i>Article</i>   |
|-------------|--|
| C1          | He, J. and G. Liu (2010). "The Importance and Basic Method of User Experience: On the Usage Case of Web Design." <i>Art and Design</i> 3: 176-178.   |
| C2          | Li, H.-f. and J. Yin (2011). "Social Network User Experience from the Otaku Culture Perspective." <i>Packaging Engineering</i> 32(24): 113-116.  |
| C3          | Li, X.-q. (2010). "User Experience Design Based on User Mental Research." <i>Information Technology</i> 28(5): 763-767.  |
| C4          | Liuzi, H., F. Zhang, et al. (2010). "Comparative study on search effectiveness of Google and Baidu based on user experience. ." <i>Journal of Zhejiang University(Science Edition)</i> 37(5): 605-610. |
| C5          | Ni, L. (2008). "The Duties of Web UI Design." <i>Art and Design</i> 5: 24-25.  |
| C6          | Wei, W. and X. Gong (2011). "HCI develop trend based on user-experience. ." <i>Journal of Beijing University of Aeronautics and Astronautics</i> 37(7): 868-871.                                       |
| C7          | Zhang, Q. (2011). "The Clicking Read with Mouse, A New Method of Web-site User Experience Evaluation." <i>Art and Design</i> 86: 72-74.  |

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### Author Biographies.

#### ATHER NAWAZ

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Ather Nawaz is a user experience (UX) researcher and usability expert with an interest to look into users side of information systems. He is currently a Ph.D. student in the Department of IT Management, Copenhagen Business School, Denmark. His research interests include websites information structure, Usability and User experience (UX) reserach, Informaiton classification and methods for evaluation of web information structures.

#### TORKIL CLEMMENSEN

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Torkil Clemmensen is a Professor in the Department of IT Management, Copenhagen Business School, Denmark. He has more than 20 years of academic and industrial experience with human-centered methods and techniques for analysis, design, and evaluation of information and communication technology and digital media and how these are designed and used in organizational, human, social and cultural context.