Website user experience:

A cross-cultural study of the relation between users’ cognitive style, context of use, and the information architecture of local websites

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Citation


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Acknowledgment

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Ather Nawaz

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Abstract in English

Increasing globalization and technological development has led companies and people across the globe to connect through the global internet community. However, people with different cultural backgrounds may perceive the same information in different ways. One of the hurdles to use websites efficiently is the indifferent structures of information on website, and their relation with the characteristics of intended users and the context of use for the websites. The purpose of this dissertation is to assist Human-Computer Interaction (HCI) practitioners and researchers with better design of website structures for user groups with different cultural backgrounds.

This dissertation looks into issues related to website user experience (UX) and focus on how the structuring of information is seen from local users’ perspectives. In particular, it attempts to look into the alignment between websites’ information architecture (IA) and users’ views of website information structure, by applying a cross-cultural and context of use perspective on the UX of websites in three countries: Pakistan, Malaysia, and Denmark. The researcher investigates to what degree users’ cognitive styles and contexts of use are aligned with local websites’ information architecture, and how this (lack of) alignment shapes the resulting UX.

This dissertation adopts a mixed-method approach to studying the UX association with users’ cognitive styles, contexts of use, and website structures. In this regard a critical literature review of the existing HCI research on website UX in Asia was performed. Four UX studies were conducted on local university websites in Denmark and Pakistan, and local e-commerce websites in Pakistan and Malaysia. Empirical data was collected through questionnaires, card-based brainstorming, card sorting, information retrieval tasks, and retrospective interviews with 108 university students across four studies. Users’ cognitive styles were captured through users’ information classification (card sorting) activities with website contents. These data were analyzed through edit distance measures and hierarchical clustering through dendrograms. The context of use was captured by collecting data on domains of websites, interviews about the use of languages, background questionnaires, and information retrieval tasks. These data were analyzed through quantitative analysis and coding of retrospective interviews. The structures of the websites
were captured through analysis of website navigation and labels employed by each website.

The literature review revealed that HCI research into website UX in Asia is growing, in particular examining academic, e-commerce websites, and tourism websites. The literature review indicated that the use of cultural theories and frameworks for studying website UX is limited. The results of the four UX studies indicated differences in cognitive style and context of use across the three locations, Denmark, Pakistan, and Malaysia. The Pakistani users appeared to have larger within group variation in cognitive styles than the other user groups, as measured by differences in their information classification (card sorting). There was a lack of alignment between cognitive style and IA of local websites for Pakistani users, as they appeared to spend much time to retrieve information located deep in the website hierarchy. There was a closer alignment between cognitive style and IA of website for users in Denmark as users spend relatively less time to retrieve similarly placed information. The Malaysian users appeared to be more similar to Pakistani users in term of their cognitive style measured by differences in their information classification (card sorting), when compared with Pakistani users.

This dissertation concludes that website structures do matter for users with different cultural backgrounds. It concludes that a high degree of alignment of local users’ cognitive styles and context of use with the website IA improves the website UX. The dissertation also discuss critical methodological issues in using local data in performing cross-cultural comparative analysis of website UX. This dissertation contributes to HCI theory with a model that combines context of use, cognitive style and information architecture that can be used to study and compare website UX across countries. The finding of study has implications for UX practitioners, as it sheds a new light on the need for alignment between website structures and users’ cognitive styles and context of use. The study contributes methodologically by combining the activities of card-based brainstorming, card sorting, information retrieval tasks, and retrospective interviews in a cross-cultural comparative study of UX. The main contributions of the dissertation are reported through four articles and are directed at both academic HCI researchers and practitioners.
**Resumé på Dansk**

Globaliseringen og den teknologisk udvikling har medført at individer og virksomheder med forskellig kulturel baggrund over hele verden bliver forbundet gennem det globale internet samfund. Information bliver dog ikke nødvendigvis opfattet ens af mennesker med forskellig kulturel baggrund. En af forhindringerne for at kunne bruge websider effektivt er ufleksible informationsstrukturer, samt disse informationsstrukturers forbindelse med karakteristikker af de ønskede brugere og deres kontekstspecifikke anvendelse. Formålet med denne ph.d.-afhandling er at bidrage til at praktikere og forskere i Human-Computer Interaction (HCI) kan designe bedre informationsstrukturer til hjemmesider rettet mod brugergrupper med forskellige kulturelle baggrunde.


Ph.d.-afhandlingen anvender en kombineret (mixed-method) tilgang til at undersøge brugeroplevelsens forbindelse til brugernes cognitive stil, brugskontext og hjemmesidens struktur. Indledningsvis blev der udført en kritisk litteraturgennemgang af HCI forskningen i brugeroplevelsen af hjemmesider i Asien. Der er gennemført fire brugeroplevelses-undersøgelser af lokale universiteters hjemmesider i Danmark og Pakistan, samt lokale e-handels hjemmesider i Pakistan og Malaysia. Der er blevet inddsatte empiriske data gennem spørgeskemaundersøgelser, kort-baseret brainstorming, kort-sortering, øvelser i informationstilegnelse og retrospektive interviews med 108 universitetsstudere under de fire studier. Brugerenes cognitive stil blev undersøgt gennem øvelser med klassifikation af information (kort sorterings-øvelse) fra en hjemmeside. Disse data blev analyseret ved

Litteraturgennemgangen viste at HCI forskningen om brugeroplevelsen af hjemmesider i Asien er voksende; især når det gælder akademiske, e-handel og turisme hjemmesider. Litteraturgennemgangen indikerede, at brugen af kulturelle teorier og -modeller til at undersøge brugeroplevelsen af hjemmesiden hidtil har været begrænset. Resultaterne af de fire brugeroplevelses-undersøgelser indikerede forskelle i kognitiv stil og brugskontekst på tværs af de tre lande: Danmark, Pakistan og Malaysia. De pakistanske brugere syntes at vise større variation inden for gruppen i deres kognitive stil sammenlignet med de andre brugergrupper, når dette blev målt ved forskelle i klassificering (kort sortering) af information fra hjemmesiden. Der var en ringe grad af afstemning mellem de pakistanske brugeres kognitive stil og de lokale hjemmesiders informationsarkitektur. Dette fremgik ved at de pakistanske brugere anvendte lang tid på at hente information der var placeret dybt i hjemmesidens struktur. Der var en bedre sammenhæng mellem den kognitive stil og hjemmesidens informationsarkitektur hos den danske brugergruppe, idet disse brugere anvendte mindre tid på at finde information placeret dybt i den lokale hjemmesides struktur. De malaysiske brugere lignede de pakistanske i deres kognitive stil, målt ved klassifikation af information (kort sortering).

Denne afhandling konkluderer at hjemmesidestrukturer har betydning for brugere med forskellige kulturel baggrund. Den konkluderer at en høj grad af afstemning af lokale brugeres kognitive stil og brugskontekst med den lokale hjemmesides informationsarkitektur forbedrer brugeroplevelsen af hjemmesiden. Afhandlingen diskuterer også kritiske metodologiske spørgsmål ved anvendelse af lokale data i tværkulturel komparativ analyse af brugeroplevelsen af hjemmesider. Denne afhandling bidrager til HCI teori med en model der kombinerer brugskontekst, kognitiv stil og informationsarkitektur, og som kan bruges til at undersøge og sammenligne
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1 Introduction

From a historical perspective, the number of website users in emerging countries, particularly those in Asia, is growing (Pingdom, 2010). At the same time, websites that people in one country use may have been designed, developed and evaluated by people in another country, in another part of the world (Sahay et al., 2003). In this dissertation, I present and discuss findings from a systematic investigation into the user experience (UX) of a website as the outcome of the interaction between the user’s view of the information on the website and the website’s information architecture in three countries: Denmark, Pakistan, and Malaysia. The dissertation thus provides insights into how a website is used in different countries, and makes available knowledge that can be used to better understand how to localize website design to a specific country.

Advances in technology have made a positive impact on website use, and people increasingly use websites as a source of information dissemination, knowledge sharing, and information retrieval. With a growth in internet users, website use has evolved. It has become an integrated part of different domains such as e-commerce, e-government for information dispersion, and information sharing (ElSaid & Hone, 2004; Minocha et al., 2006; Patel & Jacobson, 2008). Organizations are utilizing website technologies for various purposes, including promotions of products and services, exchange of information, and connecting with stakeholders (Punchoojit & Chintakovid, 2012). Organizations are spending resources to improve and appropriate websites for their stakeholders across the globe to make them accessible to everyone. In developing countries, particularly in Asia, the internet infrastructure has skipped a generation and gone straight to broadband, with much of that being mobile (West, 2011). Asia accounts for nearly 45% of worldwide internet users with an estimated 19% of the total Asian population using the internet (Nisbet et al., 2012). These advancements have made it convenient for end users to access information on websites in their daily life. Public and private companies are using websites not only as a way to broadcast and disperse information but also to get commercial products to the population.
On the other hand, people in different countries and regions of the world may perceive information on websites in different ways. Studies from HCI and related fields indicate that people in different regions of the world may tend to apply different ways of thinking about information and how it is organized, which are related to their cultural backgrounds (Yeo & Loo, 2004). Such differences in perception of information may come from differences in the values, attitudes, communications, social practices, and cognitive styles of users (Nisbett, 2003; Plocher et al., 2012). These cross-cultural design concerns also exacerbate issues that already pose challenges in single-culture design. While differences exist in single-culture design between subgroups of users, and between designers and (subgroups of) users, such differences become more profound in cross-cultural design.

This thesis focus on users’ cognitive styles and contexts of use, and how these are aligned with the information architecture of a local website, and how this shape the website UX. Cognitive style refers to the different ways in which people think about and remember information. This view of cognitive style is in line with Nisbett (Nisbett, 2003, Ji, Peng and Nisbett, 2000, Na, etl., 2010) and Witkin’s (1967) view of relating cognitive style with analytical and holistic cultures. People living in Analytic cultures tend to “detach a focal object from the perceptual field, categorize objects taxonomically and ascribe causality to focal actors or objects”. People living in Holistic cultures tend to “pay attention to the entire perceptual field, especially relations among objects and events, categorizing objects on the basis of their thematic relations, and attributing causality to context” (Na, et., 2010, p.6192, see also Nisbett, Peng, Choi, Norenzayan, 2001; Nisbett, 2003).

Information architecture (IA) refers to the structure of the website, or in more tangible terms, the wireframes of websites. Wireframes helps HCI researchers and designers to determine where to place certain contents of the websites. This dissertation uses a more narrow view than the broad view of IA given by Morville and Rosenfield (2006). According to Morville and Rosenfeld (2006), three things make up information architecture: context, content and users.

The context of use refers to the characteristics of intended users, the tasks users perform, tools users use and the environment in which users use the system (ISO 9241-210, 2010; See also Hertzum, 2010). For example, context of use can include the domain of a website,
the users’ skills in navigating a website, and other issues related to the users’ cultural background, such as the users’ everyday language use (Nantel & Glaser, 2008).

UX is a subjective measure of the quality of a website as seen from users’ perspectives. UX of websites plays an important role in users’ use of government and private sector websites. Researchers have described UX as the major factor in the adoption of websites services by its users (Patel & Jacobson, 2008; Smith et al., 2007). Users’ interactions with websites, along with design and page layout are among the most important UX issues, particularly for websites that are used in developing countries (Abanumy et al., 2005).

The dissertation aims at adding to knowledge in the field of human-computer interaction (HCI) and information systems (IS). HCI is a field of research that studies, plans, and designs the interactions between people (users) and computers (Sears & Jacko, 2007). Information systems (IS) is a field of research that studies networks of hardware and software that people and organizations use to collect, filter, process, create, and distribute data (Jessup, Valacich, & Wade, 2008; Zhang & Li, 2004). HCI and IS are partly overlapping. HCI within IS, while maintaining a focus on the individual differences among users in human-computer interaction, is also concerned with business, organizational, social, and cultural aspects of the interaction between humans and computers. This dissertation take a cross-cultural perspective on the UX of websites, and thus follows the tradition of HCI within IS related research.

My research vision in this dissertation is to conduct a systematic investigation into the UX of websites as the outcome of the interaction between users’ views of the information on the website and the website’s information architecture in three countries: Denmark, Pakistan, and Malaysia. Thus this dissertation is a cross-cultural study of website UX. Within the broad topic of website UX, I focus on relating the context of use and users’ cognitive styles to websites’ information architecture. I argue that the relationship between a website’s information architecture and its context of use, and users’ cognitive styles when classifying information, shape the resulting user experience. Thus there are four concepts that I want to relate together: 1) cognitive style, 2) context of use, 3) information architecture topics, and 4) user experience (UX). By the UX of a website, I refer to the current standard definition of UX as “a user’s perception and responses that result
The ISO standard ISO 9241-11 describes usability as the extent to which the product can be used by the specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in specified context of use" (ISO 9241-11, 1998, p.2).

This is cross-cultural study that aims to understand the relation between users’ cognitive styles, context of use, and local websites’ information architecture, when users look for information within a website that is mainly intended for use within a given country or geographic region, hereafter called a local website. This is important because the shared knowledge and common practice of a particular local user group in a particular location may shape their UX of a local website.

1.1 Rationale and focus for the research

This research addresses the relevance of users’ cultural backgrounds and context of use in relation to a website’s information architecture, and the resulting UX. There are two reasons for doing this.

First, there is an extensive range of research addressing the issues of cross-cultural and multicultural websites, i.e. websites that are designed explicitly for an international audience or supposed to be used in many countries (Evers & Day, 1997; Marcus & Hamoodi, 2009). Much of this research literature focuses on interface design issue and website aesthetics (Evers et al., 1999; Marcus, 2003). In contrast to this, there is at present little cross-cultural research with a focus on users of local websites (Clemmensen & Roese, 2010). In order to design and develop websites for use, website designers must have an in-depth understanding of the relation between users’ cognitive styles, context of use, and local websites’ information architecture. This dissertation takes such a cross-cultural perspective on the issue of local websites.

Second, the process of localization is supposed to generate culture-dependent components of websites for target cultural user groups (Yeo, 1996). On the other hand, development practices are globalizing information structures to make them theoretically accessible to a wide range of users. These conflicting and often confused development practices draw
upon a fundamental question about how a target audience’s cognitive processes relative to website structures impact on those websites’ information architectures, and what role the target users’ context of use play in the construction of the information structure. For example, research on ‘cultural markers’ has addressed the issues of both localization and globalization of website design (Barber & Badre, 1998). Cultural markers are preferred patterns and features for each local user population that are followed in the design of a website. Cultural markers may include the use of national symbols, specific colors, and information space in web design. Cultural markers research addresses localization by taking a number of countries, and defining markers for users from those countries. Cultural markers research thus supports both localization and globalization of website design. However, cultural markers do not address the information structure of websites, do not cover important aspects of localization, and do not take into account how people perceive local websites.

Sun (2001) argued that it is possible to distinguish between culturally different user groups that each have their own norms, which again lead to different perceptions of websites. Although industry practices might be pushing website designs towards standardization and internationalization (Singh & Boughton, 2005), designers may inevitably follow local cultural norms when designing websites. This may be the case even when designers are designing websites for clients in other countries. Websites designed and developed in a conventional way in one country may still be influenced by the specific common knowledge and practice shared by the local population from which the designers are drawn, such as the hierarchical structure of society and workplaces within society, rhetorical strategies, and strategies for processing information (Sun, 2001). The local contexts of use of a website, and the local users’ cultural background may, however, shape the design and the use of the website, and crucially its information architecture.

So what happens when a user from one country, such as India, Pakistan or China attempts to use a website that is based on an information structure developed and designed based on principles and software from another part of the world, such as Denmark, Sweden, or Germany? Or inversely, what happens when users from countries like Denmark, Sweden or Germany attempt to use websites developed by software developers from countries such
as India, Pakistan or China? I hypothesize that it will affect the UX of the website, because the user will sense that information is organized in an unfamiliar way.

Figure 1 shows a literature map that outlines localization and IA literature, and points out the need for studying context of use, IA, and cognitive style. It relates usability and UX with culture and information architecture. The arrows on the map indicate the direction from the starting point of the issue of localization of website IA, through topics of current literature theories and frameworks, and ending with the main concerns related to the need for performing cross-cultural research on website UX that is presented in this dissertation.

One technique that offers interesting possibilities for eliciting cross-cultural aspects of website information structure is card sorting (Hurd, 2002; Nielsen, 2004; Rugg & McGeorge, 1997). Card sorting has been successfully used to elicit webpage quality and users’ understandings of websites’ structures. Card sorting generates rich data about users’ categorization and structuring of the domain under investigation. Therefore, one of the purposes of this study is to investigate what different card sorting analyses can tell (and not tell) us about local website UX in a cross-cultural study, and how the use of this method may influence the design of local websites.

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1 The concept of information architecture is explained in section 3 of the cover chapter; Information architecture (IA) is the field of study and information structure is the product that is an outcome of IA.
Figure 1: Literature themes of study
1.2 Research Question

The investigated research questions are the following:

RQ: To what degree are users’ cognitive styles and contexts of use aligned with the information architecture of a local website, and how does the (lack of) alignment shape the UX?

RQ 1.1: Which issues, related to websites and types of websites, are prominent in website UX research done in Asia?
RQ 1.2: How do local users’ cognitive styles relate to their context of use when using local websites?
RQ 1.3: How do local users’ cognitive styles and context of use relate to the information architecture of local websites?
RQ 1.4: How may do different card-sorting analyses influence the design of the information architecture of a website?

The dissertation thus investigates the alignment between the information architecture of a local website and its local users’ cognitive styles and contexts of use, and how the degree of alignment may influence the resulting UX for local users in Denmark, Pakistan, and Malaysia.

1.3 Disposition of the dissertation

In the rest of this cover chapter, I present the background, theory, theory of science, empirical research, results, discussion and conclusion. After the cover chapter, I present the four articles that are part of the dissertation. The appendices contain materials for the reader to fully understand the research procedures.

The cover chapter is structured according to the eight sections described below.

Section 1: Introduction

The first section of the chapter outlines the different concepts that I use in the dissertation. These concepts are cognitive style, context of use, information architecture (IA), and user experience (UX). This section outlines the relevance of and motivation for using these
concepts, outlines the primary research question and four sub-questions in relation to the primary research question, and presents an initial overview of relevant literature for the study.

**Section 2: The setting**

Section two of the cover chapter provides the background of the study. This section provides a discussion of standardization practices of website designs from two perspectives: internationalization and localization. It also introduces the differences in the background of the users of websites and differences in their use of languages.

**Section 3: Theory and related work**

This section provides the theoretical background of the dissertation and related work. It presents multifaceted perspectives of the notion of a cultural group and its complexities. The presented theories and approaches to culture encompass a broad set of theoretical concepts from sociocultural, anthropological, and cognitive psychology approaches. The section explains cognitive styles, context of use of websites, UX, and information architecture. This section also provides a critical reflection on these concepts. This section opens up the discussion of the conceptual challenges surrounding the concept of culture.

**Section 4: Theory of Science in this dissertation**

Section four of the cover chapter discusses some relevant research foundations for engaged scholarship, and identifies the research foundation of this study. This section describes different philosophical standpoints and general foundations that are followed in human-computer interaction and information systems research. At the end of section, I explain the philosophical standpoint of this dissertation.

**Section 5: Empirical research**

This section explains the method, research design, participants, instruments, procedures, and data analysis approach of the empirical studies performed. In this section, the study argues in favor of a pluralist approach to the research (Creswell, 2009). It reflects upon how research results are richer and more reliable when methods are routinely combined together. It describes the role of a test leader in conducting a UX study. This section
describes the selection of participants in studies and the recruitment procedure. It also explains the relationship between empirical studies, describes the demographics of the users, and explains different data analysis techniques that have been used during the studies.

Section 6: Results

This section presents the four studies conducted and provides critical reflection on them, including an explanation of the results. To provide a full picture of the research done, it also includes additional data that have not been presented in the four articles attached.

Section 7: Discussion

This section provides a discussion on the main results of the study and their relation to the existing theories presented in the theory section. Furthermore, I reflect on the different methods used during the studies. Limitations of the studies are also explained in this section.

Section 8: Conclusion

Section 8 concludes the cover chapter by answering the research questions and outlining the theoretical and practical contributions. This section explains the contribution of this dissertation as well as the future work. Finally, this section explains how this research helps to build better websites.

1.4 Introduction to the empirical research

The perspective of local users of local websites was studied in a literature review and four empirical studies that are presented in sections 5, 6, and 7. As this dissertation explores the research topic mainly from the empirical point of view, I will briefly introduce the empirical research before proceeding to explain the background, theory, method, findings, and results. Table 1 gives an overview of the empirical research.

In the first two empirical studies (study 1 and study 2), I compared users’ perceptions of the structure of the information on the website through UX experiments at two different locations (Pakistan and Denmark). These studies explored the users’ understanding of information classification by applying a variety of UX methods, such as card sorting, task
exploration, respondents' feedback on their use of a local website, and analysis of the information structure of the website. I conducted the first study in Pakistan between December 2009 and January 2010. The study looked into the users' perception of classification of information, and the resulting UX, of a local university website in Lahore, Pakistan. I conducted the second study in Denmark in August 2010. The second study, similarly to the first study, looked into the users’ views of the information, and the resulting UX, of a local university website in Copenhagen, Denmark. Study 1 was conducted with 14 participants in Pakistan. Study 2 was conducted with 14 participants in Denmark. These two studies are reported in the second paper of the dissertation (Nawaz et al, 2011). I compared the findings from the first two studies, and found a number of differences in how local users viewed local websites at these two different locations. The comparison of study 1 in Pakistan and study 2 in Denmark suggested that the findings from Pakistan were different from what could be expected from the current literature on website UX in Western countries (such as Denmark). For example, in Pakistan there were issues related to the context of use in the form of the multiple languages used by local users and on the local university website. These first findings indicated a need for a deeper exploration of issues related to the users’ views of local websites in Pakistan and in other countries that could be assumed to share a similar socio-cultural background and other properties.

I conducted my third study in Pakistan in May 2011 and the fourth study in July 2011 in Malaysia. These studies examined whether the found differences in studies 1 and 2 were due to differences in cultural background and context of use, and how these findings might relate to methodological issues in my research. For studies 3 and 4, I chose to use local home appliances websites, since these would allow users to be in other and perhaps more typical roles than that of a university student. Furthermore, my literature review indicated that a possible explanation for the found differences between local users’ views of local websites in Denmark and Pakistan could be differences in users’ cognitive styles, so I chose to focus on cognitive style, and in particular users’ patterns of classification and information retrieval. Studies 3 and 4 thus applied the same methods as studies 1 and 2, but with different types of users, and with a clearer focus on users’ cognitive styles and context of use. The methods included having participants organizing information through card sorting tasks, information retrieval on websites, evaluation of websites, and the
retrospective interviews. Study 3 was conducted with 30 participants in Pakistan. Study 4 was conducted with 38 participants in Malaysia. The findings from studies 3 and 4 did indicate, as expected, that the local users in Pakistan and Malaysia share a similar view of local websites. For example, users in both Pakistan and Malaysia had problems with multiple language use, lack of internet literacy, and to some degree preferred a different way of classifying information from the taxonomy made by designers of the websites’ information architecture. There is a relatively large distance between the users’ classification of information on the website and the actual information architecture in Pakistan and Malaysia, as compared to that in Denmark. These findings suggested that the issues related to website UX in Pakistan and Malaysia are systematically different to the issues that local users in Denmark face. Surprisingly, however, the findings indicated that local users in Pakistan and Malaysia do not have similar, but rather different issues with local websites, including different language use issues and different views of what information should be considered central. Overall, however, studies 1-4 indicate that there are systematic differences between local users’ views of websites’ IA in Denmark on the one hand, and in Pakistan and Malaysia on the other, and that these differences may influence the UX of local websites. These findings from the two studies (studies 3 and 4) are reported in the third paper in the dissertation, entitled “Information Classification and Information retrieval on Websites: Users Interaction on E-commerce Websites in two Asian Countries”.

Since card sorting was used throughout as the main method for data collection and analysis, a deeper analysis of card sorting results may provide a critical reflection on the use of card sorting in cross-cultural studies of website UX. The data from study 4 was used for an analysis of the card sorting method itself. The card sorting analysis explored how the choice of card sorting analysis affected the suggested information structure for websites. In the card sorting technique, a variety of methods are used to analyze the resulting data. The analysis of card sorting data helps designers to discover patterns in how users make classifications and thus to develop an optimal, user-centered website structure. Analysis of card sorting thus drew attention towards how the same data for card sorting can lead to different assessments of user-website alignment, since the agreement level between users can change for similar data based on the choice of analysis. This analysis of card sorting is
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<td>Information classification on university websites: A two-country card sort study.</td>
<td>Information classification and acquisition on websites: users’ interaction on e-commerce websites in two Asian Countries</td>
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<td>Which issues related to websites and domain of websites are important in website usability research done in Asia?</td>
<td>How users’ cognitive styles relate to their context of use when using local websites</td>
<td>How do local users’ cognitive styles and context of use explains information structure of local websites</td>
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2 The Setting

Understanding user groups’ cultural backgrounds and their contexts of use is important for companies to improve the UX of websites in countries such as Pakistan and Malaysia. Pakistan and Malaysia are ethnically diverse countries (World Bank, 2012). Malaysia is a multicultural country comprised of different ethnic\(^2\) groups, with a slim majority of the population belonging to the mainly Muslim Malay ethnicity (50.4%), the Buddhist Chinese ethnic group being the second largest (23.7%), followed by indigenous groups (11.0%), Hindu Indian ethnicity (7.1%), and the remaining 7.8% of the population consisting of other ethnic groups. In Malaysia the government has moved toward the internet as a key communications technology, with 17.7 million (60.7% of the population) internet users as of 2012 (World Bank, 2012). Like Malaysia, Pakistan is an ethnicly and linguistically diverse country. Pakistan has a population of Punjabi (44.15%), Pashto (15.42%), Sindhi (14.10%), Saraiki (10.53%), Urdu (7.57%), Balochi (3.57%) and others (4.66%). However in contrast to Malaysia, Pakistan is country of almost homogenously Muslim ethnicity\(^3\) with Urdu as its national language. The internet has penetrated in Pakistan later in the development of information technology. As of 2012, Pakistan had 17.9 million internet users (9% of the population) and the number was growing (World Bank, 2012). For Denmark, figures from statistics Denmark 2012 show that 89.6% of country’s 5.5 million people are of Danish descent whereas 10.4% are immigrants\(^4\). Nearly half of the immigrants are from Scandinavian countries or Germany. In comparison to Malaysia and Pakistan, Denmark has ethnic groups as very definite minority of the total population of the country.

The number of websites in general is increasing rapidly on the internet. According to a recent survey by Netcraft (2012), there are 633 million active websites on the internet

\(^2\)Ethnicity is the “...subjective symbolic or emblematic use of any aspect of culture [by a group] in order to differentiate themselves from other group” (De Vos, 1975, p.16)

\(^3\)The theoretical understanding of the concepts of ethnicity, religion and cultural group will be explained later in the theoretical session of this dissertation

\(^4\)Denmark Statistics [http://www.dst.dk/da/]
with an increase of 51 million websites per year. The increase in the number of websites is expanding in the emerging markets of Asia and Africa. As the diversity of the users on the internet increases, there is an increasing demand for knowledge about human-computer interaction from local perspectives. Research initiatives regarding the local perspectives of users have started to emerge. In 2011, two workshops were held to understand the local perspective of users. The international workshop on internationalization of products and systems (IWIPS⁵) was held in Malaysia and another workshop, the IFIP INTERACT⁶ workshop on local and indigenous perspective was held in Lisbon. These workshops aimed to present different local and indigenous perspectives around the world, and tried to lead toward an international dialogue on reframing concepts and models in HCI and interaction design. Recently, a special issue of the International Journal of Human-Computer Interaction emphasized the importance of addressing the diversity in HCI and understanding interaction through local perspectives (Abdelnour-Nocera et al., 2013). From a website localization view, it is important to look into aspects of website localization in a way that does not focus solely on surface level elements such as the use of colors, symbols, and languages. We need to look further in depth into users’ interaction styles and their association with those users’ cultural backgrounds. This is important because new markets are emerging in website use in Asia and Africa, requiring global industry and government to dig into emerging market practices at the bottom of the pyramid. Researchers have increasingly called for a consideration of more diverse subject populations. A recent INTERACT workshop “HCI should not be weird”⁷ has focused on diversifying subject population. In the research literature on HCI and culture, localization practices of websites have not been studied in depth (Abdelnour-Nocera et al., 2013). With the diversity of users, information systems may lead to UX problems stemming from inappropriate design (Sun, 2006). Such information systems can be improved if localization practices are included for integrating cultural understandings of users.

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⁵ http://www.iwips.org/

⁶ http://www.informatik.uni-trier.de/~ley/db/conf/interact/

⁷ HCI should not be WEIRD!, Workshop for INTERACT 2013, Link: http://www.arolis.com/WorkshopInteract2013/
One point of contention is that much of the UX literature originates in developed nations such as the United States and the United Kingdom. Countries in Asia such as Japan and China do not appear in the top countries performing research on website UX. Thus, the research literature may not be clear on how we should come to understand local users’ perspectives, or, more specifically, the perspectives of users who live outside Western countries. Further, there is currently considerable variation in how culture is understood (or not understood) and how it might inform how IT products are adapted in different cultural groups.

In everyday life, it is often a challenge to retrieve information from websites with large amounts of content. It is well known that designers’ decisions about the structure of a system may not match how users think about the system (Del Galdo & Nielsen, 1996; Norman & Draper, 1986). The challenge may, however, not be the same in different countries. A central issue in good website design is the classification of information (Dumais & Chen, 2000; Parsons & Wand, 2008). If website information is classified in a manner that fits well with how users think, information retrieval will be efficient, and may even be experienced as satisfying (Bernard, 2000; Cole et al., 2007).

Many countries have only recently joined the global internet community. Most cross-cultural studies of websites have focused on cross-cultural UX (Chiu, 1972; Clemmensen et al., 2007; Clemmensen, 2012; Marcus and Gould, 2000; Mushtaha and De Troyer, 2009), including language biases (Alostath et al., 2011; Ji et al., 2004) in Asian and Western websites. Little work appears to have investigated users’ cognitive style and structure of websites in communities that have recently joined the global internet community.

Users of websites may perceive them in different ways (Mvugi et al., 2008; Yeo, 2002). Developing websites to cater for different cultural groups at the same time is a complex process, as the target users of any given website may be diverse. Companies cater to users’ interaction styles in a variety of ways. This includes spending resources to deal with user-centered design issues for those cultural groups whose users come from different socio-cultural background and use different languages. Companies spend these resources, for example, to translate their website in languages which fit better with the local users’ language priorities. This issue becomes more important for developing nations, which
frequently consist of multiple ethnic groups. The likelihood of websites having been
developed for each of these ethnic groups is fairly low. Thus, the cultural-fit of websites
includes the use of multiple languages, providing local content, and focusing on users’
approaches to interaction within the target communities.

Although with advances in search engine technologies some users may arrive at their
target information with well-formulated queries, for others web navigation itself remains
an indispensable method for locating unfamiliar information (Katsanos et al., 2008a,b;
Marchionini, 1997; Spencer, 2006; Wu & Miller, 2007). In terms of the UX of local websites,
the contents of a website are generally organized into different levels of hierarchies, which
in turn affect users’ response times and success in finding information.

2.1 Internationalization and localization

The increase in diverse users and numbers of websites is fuelling the discussion of
standardization practices through two angles: internationalization and localization.
Internationalization and localization are development processes that have been used in
software engineering to adapt products for use and sale across many countries. Carey
(1998) describes internationalization and localization in information systems as follows:

Internationalization is the process of extracting the domestic, cultural context from a
package. The end goal is to end up with a sort of generic product with an appendix or
attachment that contains all the culturally specific items. In other words, it is the
separation of product elements into culturally dependent and culturally-independent parts
(…) Localization takes a generic product and adds features and elements to fit the target
culture and market. (Carey, 1998, See also Kamppuri, 2006)

Yunker (2003) described the concept of localization of websites and defined it as the
"process of modifying a website for a specific location" (Yunker, 2003, p.17). Localization of
websites concerns two key issues: content localization and cultural localization. Content
localization includes the localization of the data and information in a websites. This
information is presented in the local language that suits the local cultural context of use.
Cultural localization of a website explains the general local practices in websites design.
Rau and Liang (2003) have argued that localization for designing websites for Asian users,
particularly cultural localization, is relatively less developed.
Kamppuri (2011) has argued that although some papers discussing internationalization and localization are looking into HCI issues, their main interest often lies in finding the most convenient ways of making the development and maintenance of international software more efficient rather than considering UX. The concept of internationalization and localization is often criticized for focusing on surface level issues surrounding elements of the user interface (Angeli et al., 2004; Kamppuri, 2011).

2.2 Accommodation of local users’ interaction style and language background in websites

Development and research in websites in emerging countries tries to addresses local users’ requirements by looking into surface level differences such as color, icons, and language use. The UX of any website or software application may be associated with its users’ personalities and cultural backgrounds (Choong, 1997). It has been noticed that in emerging economies, companies do not talk to their user groups directly (Shakir & Nørbjerg, 2013). Due to this, the only localization possibilities may be that website languages and symbols are translated into local language. Furthermore, the design of websites may be based on metaphors taken from everyday life in the specific country in which the website is developed.
Figure 2: The content organization of a leading newspaper in Pakistan

Figure 2 presents a screenshot of how the website of one of the media companies in Pakistan shows information on its website. The websites show bilingual text with a number of categories. The panel on the right side of the web shows numbered contents in Urdu. The top element on the right panel in translation as “1) Meer Khalil-ur-Rehman Sculpture of decency and loyalty”. It refers to the founder and first editor of the newspaper. Other contents are translated as: “2) Today’s newspaper, 3) my city, 4) jang (name of newsgroup) classified, 5) column (editorial) and essays, 6) Previous digests, 7) jang blog, 9) picture news, 10) jang fashion, 11) magazine, 12) today’s column (editorial), 13) jang blog, 15) latest (latest news)”.

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The website ranks 14th in popularity in Pakistan according to commercial web traffic data taken from Alexa. Due to the interchangeable use of English and Urdu language in the local community, the website contents are shown bilingually to fulfill the requirements of local users in Pakistan. The website shows a large amount of text on its first page and some pictures.

Figure 3 shows an example of the Danish news website Ekstrabladet in Denmark. The contents are translated and numbered as: “1) Ekstra Bladet (name of website), 2) The panel on the top (number 2 and 3) shows the latest news, 2) 37 minutes ago, social democrats wait for a hopeless idea, 3) See prince Joachim in a wild crash, 4) (panel for weather), 5) Front, 6) News, 7) Sports, 8) Football, 9) Flash, 11) national, 12) more”.

The website ranks 13th in popularity in the country according to commercial web traffic data in the country taken from Alexa. The website shows a modest amount of text on the front screen. The users of the websites are homogeneous in term of language use and priority for the country and as such the website contents are only shown in Danish, due to use of Danish language by the majority of the population.

From this example of popular news websites, we see that in Pakistan the news website is addressing a diverse community of readers. Whereas in the example of Danish news website Ekstrabladet which tabloid medium and thereby opposed to broadsheet media such as Politiken, which speaks to a different segment of the population, i.e. a different Danish sub culture. In Denmark newspapers tend to be either tabloid or broadsheet, whereas TV channels may be a combination of the two (e.g., TV2). It appears that the

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Pakistani newspaper web site (Figure 2) does a better job of speaking to a diverse community of readers.

Language is an important component of users’ background and priorities when interacting with websites. Language preference among users thus has serious implications for information display on websites. Figures 2 and 3 shows that users’ interaction preferences are prioritized in the information display of websites. Some people go to the right side of the website to read news in Urdu, whereas the other people go to the left side of the website to read the news in English language. This experience seems to be in contrast to research that shows that users’ perceived usability increases when a website is originally conceived in their native language (Kralisch & Koeppen, 2005; Kralisch et al., 2006; Nantel & Glaser, 2008).

Figure 3: The content organization of a leading newspaper in Denmark

13 Screenshot of website in Denmark, Ekstrabladet, http://ekstrabladet.dk/ retrieved on August 05, 2013
Information about users’ language proficiency may help to understand the relationship between the choice, availability, and use of language for information on a website, particularly for online retailers and e-commerce websites eager to enhance their sales by attracting national and international users. Thus, understanding the importance of language in destined locations can enhance the UX and accessibility of websites (Clemmensen, 2011).

The language background of the user groups in the countries studied in this dissertation is quite diverse. In Denmark, more than 98% of the population speaks Danish (Eurobarometer, 2006). German is also recognized as an official regional language in the Nord-Schleswig region that borders Germany where 23,000 people (0.4% of the total Danish population) speak German. The survey of the European commission (Eurobrometer, 2006) showed that 86% of the population of Denmark stated that they could speak English as a foreign language, with 44% of the population stating that they use their English skills, although not every day.

In Pakistan the language background of the users is quite diverse. Urdu is the national language of Pakistan although only 8% of the Pakistani population speaks it as their first language. The main languages spoken by population in Pakistan are Punjabi (44%), Pashto (15%), Sindhi (14%), Saraiki (10), Urdu (8), and Balochi (4%)\(^\text{14}\).

\(^{14}\text{Information taken from the World Fact Book:}
Figure 4: The content organization of a leading newspaper in Malaysia

Figure 4 presents a screenshot of how one news website in Malaysia displays its information. The website shows information in four different languages, with figure 4 depicting the Chinese language version of the website. The contents are translated as: “1) Chinese, 2) Contact us, 3) Name of the website, 4) Login, 5) IP Login, 6) Subscribe now, 7) Parliamentary seats, 8) Barisan national (In Malaysia), 9) People Alliance”.

Malaysia is home to speakers of 137 living languages. Among these 137 languages, the Malay language is spoken by a majority (54%) of the population. Chinese is second most spoken language (23%) and Tamil is spoken by 7% of the population.

The information on websites in Malaysia might be presented in ways that suit Malaysian users’ interaction styles. For example, the information is presented to fulfill the


requirement of users with different language backgrounds. The website shows a considerable amount of text, with options to change the language between English, Malay and Chinese. The contents of the website are presented to the users in English, Bahasa Malaysia, Chinese and Tamil. The website ranks 10th in popularity in the country according to commercial web data taken from Alexa\textsuperscript{17}.

In summary, local users from different geographical locations have different cultural backgrounds that are indicated in the design of the websites in each country.

3 Theory and related work

This section of the dissertation reviews the concepts and theories related to cultural background, context of use, information architecture, and UX, and outlines the theoretical approach used in this dissertation.

3.1 Cultural background of website users

In this section, I introduce and explain the aspects of culture that will is covered and not covered in this dissertation. I look into the notion of culture from my knowledge about HCI and how culture is applied in the field of HCI. I address culture from a cognitive psychology perspective because I am interested in culture in regard to users cognitive style and website use. My perspective and analysis of cultural aspects of website user experience is mainly inspired by that of Nisbett (2003). In Nisbett’s view, culture profoundly influences the contents of thought through shared knowledge structures. Humans learn basic cognitive processes in their childhood. Children develop particular models of the world, including theories of mechanics, theories of natural kinds and a theory of mind. In my view, humans’ particular models of the world must have some implications for their approach to interaction with websites. Understanding website UX thus requires an evaluation of websites that focuses on users’ models of information when they interacting with those websites in particular contexts of use.

This dissertation will not look into the aspect of culture as an anthropological phenomenon. This dissertation do not treat culture as a complete whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.

My perspective of culture is pragmatic; I try to use the concept of culture to create knowledge within HCI. In this dissertation, I treat regional and national culture as relatively stable social phenomena that are great sources of inspiration for understanding human-technology relations such as website use and website design. I appreciate that culture is a complex phenomenon, but choose to focus on cultural difference by studying users from different geographic regions. I do not intend to claim that all or even most cultural differences are between geographical regions, but I believe that differences
between website users from different geographical regions can meaningfully be conceptualized as cultural differences.

I am using other researchers’ work on certain psychological aspects of cultural practices to understand users’ website interaction. I will be reflective and critical towards the use of culture as an explanatory and analytical concept in this research.

While looking into the background of the term “culture”, for a long time it was simply not in the vocabulary of computer science. Culture is a complicated phenomenon with a checkered history. Williams (1985) states that culture is one of the most complicated words in the English Language. The concept of culture is not only complicated from a linguistic, historical perspective. The treatment and usage of the concept “culture” has also added to the complexity. The notion of culture as used within anthropology is widely in use, but the term ‘culture’ has historically been used in a variety of ways.

It is impossible to give an exhaustive description of the phenomenon of culture, or a complete account of the history of the concept of culture, for a number of reasons. First, the phenomenon is quite complex. Williams (1985) attributed the complexity of the concept to complicated historical developments in many European languages. Second, there is an overwhelming amount literature on the concept of culture, with more than 200 definitions of culture compiled in Kroeber and Kluckhohn’s (1952) seminal work, for instance.

3.1.1 Ethnic group, Cultural Group or a National Group?
This section will describe ethnic, cultural, and national groups and their relationship with the current research. It will outline the multifaceted perspectives of these notions and their complex nature. Culture in this section is used as an analytical tool to distinguish groups of people.

The relationships between cultural groups, ethnicity and national groups are quite complex. The goal of this section is not to answer whether the choice of using cultural group, ethnic group or national group as a unit of cross-cultural analysis is most appropriate. This section rather tries to address the nature of the complexity of these concepts. For example, taking the example of Pakistan, we find there are many ethnic groups inside that national group, including Punjabi (44.68 %) and Pashtun (15.8%). India
and Afghanistan also have a representation of Punjabi (4%) and Pashun (47%), (Central intelligence Agency, 2012) respectively in their ethnic population. In terms of conducting cross-cultural studies, what should be the unit of analysis in these kinds of situations? Should there be a cluster on the basis of ethnicity and not of nationality? Further, the Punjabi ethnicity in Pakistan is different from that in India. Even though both of them share most of the same cultural values across national boundaries, their religious beliefs are rather different. These religious beliefs have certain implications for their thinking style. On the other hand, taking the example of Pashtuns in Pakistan and Afghanistan, the Pashtuns share many shared values across transitional boundaries of the country. The ethnic Pashtun consider themselves as ethnic tribes across the boundaries between the two countries.

The term ethnicity is derived from the Greek word “ethnos” which is translated as “nation”. Ethnicity and ethnic groups have been considerably debated in cultural anthropology, sociology, and psychology (Baumann 2004). There is no single definition of how ethnicity or ethnic groups are formed. Ethnic groups are generally referred to as, but not limited to, people who have common ancestry, appearance, heritage, history, language, religion, and traditions (O'Neil, 2006). The Oxford dictionary defines ethnicity as a state of belonging to a social group that has a common national or cultural tradition (Oxford Dictionaries, 2013). This definition does not imply a difference in national and cultural tradition. While looking into the history of the term in English language, Hutchinson and Smith (1996, pp.4-5) argue that term ethnicity first appeared in the Oxford English dictionary in 1953, but that its English origin has been in use since the Middle Ages.

Ethnic identity can be defined as “a manner in which persons, on account of their ethnic origin, locate themselves psychologically in relation to one or more social systems, and in which they perceive others as locating them in relation to those systems” (Isajiw 1993, p.8). Therefore identity is an important aspect of ethnic groups.

Jones (1997) states that an ethnic group is classified as “any group of people who set themselves apart and/or are set apart by others with whom they interact or co-exist on the basis of their perception of cultural differentiation and/or common ancestry” (Jones 1997, p.13). Thus cultural difference is another aspect of the concept of ethnic groups.
In this regard, in Malaysia on a broad level we may think of three ethnic groups, Chinese, Indian, and Malay, that interact with one another on the basis of their differentiation and common ancestry, language, appearance, heritage, and traditions. While looking into Pakistan, the ethnic groups based on common ancestry are different. These ethnic groups (such as Pashtun, Punjabi, Balochi, and Sindhi) are formed on the basis of common ancestry, language, appearance, heritage, and traditions. In Pakistan, although the ethnic groups are different, their religion is a common factor across ethnic groups.

Cultural groups might be said to be made up of people who live in a particular location and who tend to think, feel, and act in a similar manner. Cultural groups are defined on the basis of their ethnic grouping, nationality, and geographical location. The term ‘cultural groups’ is generally used to refer to the ethnic groups in a country. In this regard, an ethnic group might transcend the geographical boundaries of countries whereas cultural groups include most of the properties of ethnic groups within a geographical boundary. Cultural groups are also sometimes defined on the basis of people’s occupation, expertise, and work settings (Yeo, 1996). In many larger countries people refer to a national identity or ethnicity, but practice various regional and local customs. In this regard, a person can belong to multiple groups and is not bounded by a single group. Studies have used cultural groups and ethnic groups interchangeably in the literature. Therefore, it is not straightforward to define ethnic origin or cultural group in a singular manner.

For religion, there may be a general understanding in the scholarly community to treat religion as one of the components of identity. Religion, along with nationality, shared history, and language, might be associated with the basic ‘building blocks’ of ethnicity. Religion further increases the complexity of cross-cultural research into defining ethnic groups. Taking the previous example of Punjabi ethnic groups in Pakistan and India, most of the values are shared transnationally in Pakistan and India but the religious beliefs within one ethnic group are entirely different.

In conclusion, the concepts of ethnic groups and cultural groups will be used interchangeably in the research in this dissertation. I have chosen this approach to simplify the complex discussion of differentiating between cultural groups, national groups, and ethnic groups.
3.1.2 *Socio-cultural differences in values and communication styles*

Anthropology deals with humanity and characteristics of human experience from a social and cultural perspective, but is generally equated with ethnography in HCI studies (Räsänen & Nyce, 2006). The sociocultural approach of anthropology deals with culture by examining diverse human societies and cultures (Punchoojit & Chintakovid, 2012). Generally in anthropology, culture refers to ‘socially transmitted patterns for behavior characteristic of a particular social group’ or to a ‘way of life among particular people’ (Livari, 2006; Kroeber & Kluckhohn, 1952).

HCI studies tend to use a single approach to sociocultural anthropology when dealing with culture: Geert Hofstede’s cultural dimensions (Hofstede, 1984, 2005).

### 3.1.2.1 Hofstede’s Cultural Dimensions

Hofstede’s cultural model is based on cultural values, which form the implicit core of culture. Hofstede (1984, 2005) views culture in terms of patterns of thinking, feeling and acting. He characterizes these patterns as mental ‘programs’. These mental programs vary as much as the social environment in which they are acquired. Hofstede created a five factor cultural model that is perhaps the most cited in cross-cultural web design articles (Kamppuri et al., 2006). These five factors are: power distance, uncertainty avoidance, masculinity/femininity, individualism/collectivism, and time orientation (Hofstede, 2005).

Power distance (lower or higher) is a way to explain the handling of differences between groups existing in a system of inequality. For example, Denmark has a lower power distance. Managers and subordinates have egalitarian relationships with access to near equal levels of power. Uncertainty avoidance is the degree to which people in a country prefer structured to unstructured situations. In countries with low uncertainty avoidance, people believe there should be no more rules than are necessary and that if they are ambiguous or do not work they should be abolished or changed. Masculinity/femininity is the degree to which “masculine” values like assertiveness, performance, success, and competition prevail over “feminine” values such as quality of life, maintaining warm personal relationships, service, caring, and solidarity. Individualism/collectivism is the degree to which people in a country have learned to act as individuals rather than as members of cohesive groups. Finally, time orientation refers to how much a society values long-standing as opposed to short-term traditions and values.
Hofstede provides a large amount of data, employee values scores collected by IBM between 1967 and 1973, to show that geographical region captures differences we may meaningfully label culture in this dissertation. Hofstede’s model of national culture has been extensively used as a measure in cross-cultural studies.

There is a lot of criticism of Hofstede’s model of culture for taking culture as static and monolithic state. Researchers within information systems have pointed out three major concerns. The first of these concerns the notion that culture falls along national boundaries. In Mayer’s (2003) view, understanding cultural differences in terms of national culture is an overly simplistic approach to dealing with this complex domain. The second concern is that national culture is supposed to be homogenous, discounting subcultures within a national culture. Pau Huo and Randall (1991) argue that exploring subcultural differences is as interesting as national cultural differences, and yet little focus has been given to this area. The last and most common concern which researchers find in the use of Hofstede’s dimensional model is that dimensions of culture are described at a national level whereas most of the research studies apply it to an individual case or to a local group (Ford et al. 2003; Straub, 1994).

In order to support the idea of the nation as a unit of analysis, Minkov and Hofstede (2012) objected that the critique had little empirical support. They argued with empirical evidence that the nation as a unit of analysis is true even of countries like Malaysia and Indonesia, or Mexico and Guatemala, despite their shared official languages, religions, ethnic groups, historical experiences, and various traditions. In their view these countries do not intermix much when they are clustered on the basis of cultural values (Minkov & Hofstede 2012). In summary, Hofstede’s model has got some criticism, however it has also provided value in the research done in HCI, marketing and information system.

3.1.3 **Cognitive styles and cultural differences**

Cognitive psychology is the study of the processes underlying mental events. The cognitive psychology approach examines how people perceive, remember, think, speak, and solve problems (Feist & Rosenberg, 2010; Ross, 2003). Research in cognitive psychology has indicated that people have differences in their cognitive processing styles during problem solving and decision making activities. Cognitive processes are processes that work
together to form a thought. In this regard certain activities involves different cognitive processes. Ross (2003) states:

... all the mental processes that are (or can be) subject to social transmission, as well as other elements of human behavior, including material goods and all kind of institutions that help to establish and form our mental processes. These different elements (mental, behavioral, and material) can often be understood only as a set of interrelated features, one causing/forming the other, that are in constant relation with the social, historical, and natural environment. (p.57)

Researchers have recently shown that cultures vary in basic cognitive processes, and particularly along the analytic–holistic dimension in cognitive style. Some cultures tend to have a more analytic cognitive style: “detaching a focal object from the perceptual field, categorizing objects taxonomically, and ascribing causality to focal actors or objects.” (Na, Jinkyung, et al. 2010, p.6192), while other cultures tend to be more holistic: “paying attention to the entire perceptual field, especially relations among objects and events, categorizing objects on the basis of their thematic relations, and attributing causality to context” (Na, Jinkyung, et al. 2010, p.6192). The following section further explains cognitive processes and cognitive styles and their relation to culture.

### 3.1.3.1 Culture and Cognition

The cognitive aspect of culture emphasizes that culture influences cognitive processes (Masuda & Nisbett, 2001; Nisbett et al., 2001; Norenzayan et al., 2002; Ross, 2003; Vatrapu 2007). Cognitive processes in psychology concern knowledge and the way people use this knowledge to make sense of the world (Masuda & Nisbett, 2001; Nisbett et al., 2001; Norenzayan et al., 2002). Cultural cognition theory frames the view that local culture profoundly influences the contents of shared knowledge structures. Local culture thus ultimately impacts on the design and development of websites (Faiola, 2005). It is also important to understand that this study does not take culture and cognition to be a static and monolithic state. It rather takes the stance that these cognitive processes and shared knowledge structure changes, but that this change takes time and changes do not occur

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quickly. Since website use requires knowledge, we may assume that classification is also a
cognitive process in addition to being a social, organizational, and cultural process. The
cognitive processes that are involved in people’s use of websites might be influenced by
the shared knowledge in that user group’s local culture.

In cognition, cognitive style describes the way an individual thinks and remembers
information. Cognitive style is an individual’s typical way of thinking about, processing,
and organizing information, problem solving, and learning (Riding & Rayner, 1998). It is a
way for an individual to consistently adopt a strategy to solve a problem. Witkin (1967)
argues that people’s cognitive styles are related to their family experience and the place
where they grew up.

Following the same line of argument, Nisbett (2003) and Ji et al. (2000) readdressed the
work of culture and cognition, which nobody continued after Witkin’s death. Nisbett
(2003) argues that an individual’s cognitive style is either holistic cognitive styles or
analytical. He further argues that there are considerable differences between the East and
West in term of thinking patterns.

Ji et al. (2000) used Witkin’s (1967) Rod-and-Frame test to analyze the cognitive styles of
East Asians and European Americans. They argued that on East Asians and European
Americans different field dependencies apply while looking into Rod-and-Frame test.
Nisbett and Norenzayan (2002) and Nisbett et al. (2001) defined holistic and analytical
perspectives in the following ways:

Holistic thoughts [involve] an orientation to the context or field as a whole,
including attention to the relationships between a focal object and the field.
[The] holistic approach relies on experience-based knowledge rather than
abstract logic and the dialectical. It means that there is an emphasis on change
and recognition of contradiction. Analytic thought involves a detachment of the
object from its context, a tendency to focus on the attributes of the object in
order to assign it to categories. Furthermore, analytic thoughts have a
preference for using rules about categories to explain and predict an object’s
behavior. (Nisbett & Norenzayan, 2002, p.21)
Nisbett and Norenzayan (2002) claim that most psychology concerning cognition in the 20th century strongly held the assumption that:

- "Basic cognitive processes are universal: every normal human being is equipped with the same set of attention, memorial, learning, and inferential procedures
- The basic cognitive processes work in much the same way regardless of content they operate on
- General learning and inferential processes provide the growing child with all it needs to learn about the world. Content is supplied by these cognitive processes operating on an environment
- Since political and economic worlds of different people are different, the content of human minds – theories, beliefs values etc. is indefinitely variable" (Nisbett and Norenzayan 2002, p.561).

Nisbett and Norenzayan (2002) argue that most psychologists in the 20th century held these incorrect assumptions about the relationship between culture and cognition. The misconceptions were carried from the theoretical position of learning theory as well as formalist theory. These theories assume that cognitive processes are universal and that all normal humans are equipped with same set of cognition. In HCI, similar assumptions may hold, promoting UX as universal. However Frandsen-Thorlacius et al., (2009) has challenged this assumption. These assumptions in HCI are challenged by the research presented in this dissertation.

The idea that culture shapes the contents of thought (shared knowledge) is central to modern cognitive anthropology. Recent empirical results have shown that culture and cognition are not as disassociated as traditional psychology has assumed (Ross, 2003). Nisbett and Norenzayan (2002) have stated that only some cognitive processes are universal. For example, babies are born prepared to develop particular models of the world, including theories of mechanics, theories of natural kinds, and a theory of mind. On the other hand, in Nisbett and Norenzayan’s (2002) view, some of the fundamental cognitive processes are in fact highly susceptible to change even for adults. They stated:

- “Cultures differ markedly in the sort of inferential procedures they typically use for a given problem.
The cultural differences in cognitive processes are tied to cultural differences in basic assumptions about the nature of the world that the traditional distinction between content and process begins to seem somewhat arbitrary.

Cultural practices and cognitive processes constitute one another. Cultural practices encourage and sustain certain kinds of cognitive processes, which then perpetuate the cultural practice” (Nisbett & Norenzayan, 2002, p.562).

This idea of culture shaping cognition, and their interdependence on each other has implications for website use. Users’ views of websites are shaped by their cognition. For example, when thinking about information on websites, users may be influenced by cognitive practices and traditions prevalent in their environment.

Regarding cognition, critics of cross-cultural research argue that the cross-cultural psychology tradition often assumes that variation in cognition exists only across cultures (Hermans & Kempen, 1998; Hong & Chiu, 2001), often ignoring variation within cultures, which shares the same cognitive psychological properties. In their view, variation within a cultural group is more important to study and research. Others critics of cultural psychology states that the idea of cultural cognition is purely based on cultural stereotyping and faulty methodologies in the studies.

Hermans and Kempen (1998) argue that despite widespread interest in cross-cultural distinctions, cultural dichotomies do not and cannot meet the challenges raised by the process of globalization. In their view, the process of globalization is drawing people from cultural origins into close relationships.

3.1.3.2 Cultural differences and HCI

In HCI studies, cultural models are used extensively to explain the subjective features of cultural differences in groups (Fitzgerald, 2004; Plocher et al., 2012). There is a growing literature on cross-cultural software and website design discussing both the ‘objective’ features of cultural differences, such as the scripts, fonts, and date formats people use (Nathan & Yeow, 2009, 2011), and the ‘subjective’ features of cultural differences, such as how people react to color, and so forth (Marcus & Hamoodi, 2009; Wallace & Yu, 2009, Nawaz et al., 2007). Cultural studies use cultural dimension models, cultural marker
models, and cultural behavior models. Thus, cultural dimensions have been used to distinguish between countries (national cultural user groups), cultural markers models have been used to identify culturally specific elements on websites, and cultural behavior models discuss the cultural differences in online behavior between the users of websites in different countries.

3.1.3.3 Cultural Demographics and Two Schools of Thought

To understand the phenomenon of how much cultural and demographic background affects the evaluation of websites, research must be done. There are two camps that frame this discussion of cultural understanding in interface design. First are those supporting the internationalization of websites, who argue that their strategy helps companies not only to save money, but also to help users to remember the positioning of information in different locations. These researchers, such as Nielsen (1993), use Hofstede’s dimensions to make websites that can be used across countries. However, there are also researchers who support localization practices and who are of the view that websites should present information that matches users’ cognitive models in order to be understandable to local users. Some of these researchers use Hofstede’s dimensions as the primary criteria for measuring the cultural UX of a website in a local setting. Other researchers in this second school of thought use cultural cognition theory. These researchers are more interested in the details of the interaction, rather than the national values (Chang, 2011; Clemmensen et al., 2009; Faiola, 2005; Faiola & Matei, 2005; Isa et al., 2009c; Shi, 2008). These researchers support their position by stating that culture is a discernible variable in website design and content organization and thus that culture should accommodate global users who access online information or products (Faiola, 2005). In regard to cultural UX studies, most research discusses cross-cultural website design and culturally preferred interface design (Evers & Day, 1997; Marcus & Hamoodi, 2009; Mushtaha & De Troyer, 2009; Sheppard & Scholtz, 1999; Sun, 2001). These studies discuss the relationship between culture and interface design, and to some degree take into account the design of websites in different cultural groups.

Cultural demographics and these two schools of thought are related to this dissertation as they will help in reflecting on users’ views of websites and will assist in understanding if users’ views of websites are similar or different.
Summing up on this section, there are two schools of thought on cultural demographics within HCI: one that focuses on internationalization, and the other that focuses on localization. Within the localization school – the most relevant school for this dissertation - Hofstede (1984) has been used by many HCI researchers to address issues related to national culture, whereas other researchers have focused on the cultural cognition aspect of HCI (Chang, 2011; Clemmensen et al., 2009; Faiola, 2005; Faiola & Matei, 2005; Isa et al., 2009c; Shi, 2008).

3.1.3.4 Related work on cultural marker models

Another set of studies related to the research in this dissertation are studies of cultural markers. Cultural markers are preferred patterns and features for each local user population that are followed in the design of a website. Cultural markers may include the use of national symbols, specific colors, and information space in the web design. Cultural marker models explain the preferred patterns and features in each culture that can be followed in the design of a website (Barber & Badre, 1998).

Following on from the studies of Barber and Badre (1998), Sun (2001) described a noticeable cultural marker pattern being followed in multilingual web page design. Sun argued that due to certain preferences, certain elements of cultural markers such as visuals, colors, and page layout are followed in the multilingual web page design of different cultures. One question that may arise from this is whether elements of cultural markers may also vary over a period of time as culture changes. Recent research by Mustaha and Troyer (2009) identified the settled and moving cultural markers involved in the design of website. Their study found five levels of cross-cultural markers: context-dependent markers, settled markers, broad markers, variable markers, and vista markers. Context dependent cultural markers are shared between users who use the same website category frequently. Mushtaha and Troyer (2009) expressed that users’ frequent visits create semantic meaning for website elements related to the website. Settled markers are those markers that are confirmed by studies over a period of time. The cultural markers resulting from the study of Mushtaha and Troyer (2009) were described as broad markers, whereas those markers discovered in previous studies but not appearing in the study of Mushtaha and Troyer were labeled variable cultural markers. Mushtaha and Troyer called
cultural markers that appeared on a national level via cultural markers, but did not provide further details.

Sheppard and Scholtz (1999) showed how users from the Middle East (Arab countries) and the U.S performed better when the interface design was adapted to their own culture. Sun (2001) ran an exploratory study that suggested that users prefer websites with cultural markers from their own cultures.

<table>
<thead>
<tr>
<th>Preference for cultural Markers</th>
<th>Cultures of Origin</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical and structured page layout</td>
<td>Germany</td>
<td>Low context</td>
</tr>
<tr>
<td>Attractive colors, more pictures</td>
<td>Brazil</td>
<td>High context</td>
</tr>
<tr>
<td>Visual related to local culture</td>
<td>China</td>
<td>High context</td>
</tr>
</tbody>
</table>

Table 2 shows the cultural preferences of users from high and low context cultures. High context and low context refer to a culture’s tendency to use high context messages over low context messages in routine communication. By looking at different subjects’ preferences in terms of visuals, colors, and page layout for cultural markers on the cultural level, the study found a clear connection between their preferences and their cultural contexts. The users from high context cultures shared a strong preference for visuals. This is related to this dissertation because the ways in which users tend to think about the layout and structure of webpages and their preferences for information structure may vary within and across cultures.

### 3.1.3.5 Cultural behavior model

A cultural behavior model looks into the differences of behavior between the users of websites in different countries. A user’s individual behaviors are partly determined by the values of their culture or cultures. Thus a user’s positive or negative attitude and intention toward a product can be explained better if information regarding their background culture is available. Chau (2002) investigated differences in user behavior on websites in the U.S. and Hong Kong. The study found four factors of online behavior: social communication, e-commerce, hobby, and information retrieval. The study suggests that paying attention to these factors is important. For example, an e-commerce site targeted
towards Hong Kong users may be more successful if it provides opportunities for social communication.

Users’ adoption of websites can be assessed through cultural marker issues. Cultural markers not only advocate the localization of language by translating the websites in and adding local graphics, the local content itself is also central to the positive behaviors of users adopting websites.

User behaviors are related to this dissertation as the literature indicates that users behave differently in different cultures this will reflect upon users’ behavior relative to information structure. It will further assist in reflecting upon information retrieval behavior.

3.1.4 Critical reflection on the concept of culture
The position of culture as discourse challenges the common assumptions in cross-cultural research that cultural characteristics (e.g., individualism and collectivism) are global constructs that invariantly characterize members from different national groups (Hong & Mallorie, 2004). The dynamic approach to culture rests on two premises. First, culture is conceptualized not as a general, monolithic entity, but as a loose network of domain-specific cognitive structures (including theories and beliefs). Second, an individual can hold more than one cultural meaning system, even if the systems contain conflicting theories (Hong & Mallorie, 2004). Due to globalization, culture cannot be seen as homogenous but rather as something changing constantly. In this way, whatever people construct within a society is considered a culture. The common understanding which people construct within their societies can also be constructed in a different way. So there is never one way of looking into culture, but rather there are different discourses of culture that people create. Hong and Mallorie (2004) argue that cross-cultural differences may appear or disappear depending on the availability, accessibility, and applicability of cultural theories.

Representation of a particular way of information organization can make its own culture. Bourges (1998) describes that possessing a representational system can create a culture, and that culture is partly constituted by that system (Bourges-Waldegg & Scrivener, 1998). In this dissertation, my use of the concept of culture has been inspired by the both the
dynamic situation specific approach to culture and the representational approach to
culture.

3.2 Context of use of websites

In HCI, context of use is important. First, it allows interfaces to provide information based
on the special nature of context, for example through the choice of languages, information
presentation style, and the use of cultural markers. Second, it helps us to reflect on the
common understandings of a group of users shared in a group. The context of use includes
characteristics of intended users, the tasks users perform, tools users use, and the
environment in which users use the system (ISO9241-11, 1998). In my view, the context of
use or context of use is related to users’ local culture. This includes users’ cognitive style, as
users might tend to approach the website in systematic way or they might look for
information in a random way. The context of use may also include the language proficiency
of the users, access to the internet, and their frequency of internet use.

In context of use, language is generally considered a characteristic of a cultural group. In
view of Kralisch (2006), the role of language goes beyond a characteristic of a culture.
Within a cultural group, language is used as a system of communication and exchanging
Information. Language serves as a system of symbols that contains particular meanings for
the users of the language. Users’ use of language is context dependent in the view of
Sapienza (2008), who suggests that users might maintain their own distinct languages.
Users might select default options on computers rather than elements localized according
to language.

3.2.1 Defining context of use

Within a standard definition of usability, the context of use consists of the users, tasks,
equipment (hardware, software, and materials), and the physical and social environments
in which a product is used. Context of use is also incorporated into the ISO9241-210
standard on human-centered design. This defines the process of understanding and
specifying the context of use as one of the main stages within the human-centered design
process (Maguire, 2001). The context of use is related to the local users’ culture. The
elements of context of use include systems, tasks, languages, and frequency of use of the
internet, as well as physical, technical, and organizational environments. Websites can be
thought of as being part of some specific domain, such as academic websites or e-
commerce websites. Tasks are the activities that are undertaken to achieve goals (Maguire, 2001, p.460). The technical environment also impacts on users’ ability to navigate websites. For example, users of a local culture are inclined to use a specific type of system. The website should be able to support the technical environment of the system (for example web browser on a Linux or Windows system). Language fluency is also an element of context of use as it impacts on the information design of websites. Frequency of internet use may also be stated as an element of context of use. Some users may not use the internet frequently, and this may affect their information retrieval. Physical environment is also an element of context of use. The physical environment includes the design of the workspace, the conditions in which users access information online.

The context of use of websites can be explained though the goals of the users in the local environment. For example, academic websites may focus on stakeholders such as students, teachers, administrative staff, parents, and other others directly related to the website. The context of use of an academic website may include a variety of users from different sub-cultures and therefore information should be included to address users’ requirements. The description of the activities is related to goals achieved by the users of the system. The use of the context also looks into the technical, physical, and social environment in which the system is used.

Marion and Vera (2003) draw attention to the fact that context of use also includes computer literacy. They state that most of the cultural phenomena of websites discuss cultural background and diversity in cultures, but do not pay much attention to the educational aspects of cultural dimensions. They illustrate how literacy activities in the educational system have had a direct influence on the perception and use of the web in South Africa. The study also found that the categorization of information on a websites was also one of the most frequent causes of error for students.

3.3 Information Architecture

Information architecture (IA) refers to the structural design of a shared information environment. According to Morville and Rosenfeld (2006), the term ‘information’ is used to distinguish information architecture from data management and knowledge management. The data in databases is highly structured and produces specific answers to specific
questions. On the other hand, knowledge is the information in people’s heads. Information architecture concerns with the ability to express and model concepts that require explicit details of a complex system. It is a means of organizing information in such a way that users can efficiently manipulate it (Morville & Rosenfeld, 2006; Toms, 2002).

On an abstract level, IA is a structure or map of information that allows others to find their personal paths to knowledge (Toms, 2002; Wurman, 1989). Historically the term is attributed to Richard Wurman (1997), who explained IA as a creation of structural and orderly principles. The Information Architecture Institute defines IA as the art and science of organizing and labeling websites, intranets, online communities, and software to support usability. The term ‘information architecture’ has been applied in different domains of study, but has often been loosely used and it is largely unsubstantiated. IA may be considered as a field, but it has not reached the status of discipline (Haverty, 2002).

From the perspective of UX research, IA is the art and science of shaping information in a way that will assist users to navigate better and will enhance their experience of UX. IA is understood sometimes as the skilled process of making wireframes for websites. A wireframe is the screen blueprint and visual guide that represents the skeleton framework of a website. However, IA is a field of study and explaining IA through wireframes only covers one aspect of the larger field.

### 3.3.1 Morville and Rosenfeld’s model of Information Architecture (IA)

According to Morville and Rosenfeld (2006), IA is made up of relationships between the three areas of users, context, and content. The diagram in figure 5 shows the IA model of Morville and Rosenfeld (2006).
The context of a website is related to the business context in the view of Morville and Rosenfeld (2006). This view of context is quite broad as Morville and Rosenfeld (2006) include political environment, budgets, schedules, technology infrastructure, human resources, and corporate culture in context.

Figure 5 outlines a simplified navigational structure of a bi-lingual website in Pakistan. It focuses on the context of use of the website for a variety of people with different language preferences. A concrete example of the multi-lingual website is shown in section 2.2 (figure 2).

Figure 6: Typical elements of navigation on Bilingual Pakistani website
The contents of IA in website design comprises documents, services, schema, and metadata that people use to find information (Morville & Rosenfeld, 2006). Naturally, the contents of the websites vary from one domain to another. On a university website, for instance, the contents are mostly focused towards students’ and staff’s needs and requirements. Generally, such institutional websites provide information to those who have a direct or indirect interest in obtaining information. In the case of a university, such groups could include students, teachers, parents, and administrators. Provided information might include exam results, news updates, study schedules, and other such information. The contents of an e-commerce or auction websites might typically include contents regarding product information, the privacy of buyers, and the conditions of buying and selling. In summary, the content of a website is a mix of structural, descriptive, and administrative data. Ideally, all the data should be associated with the local users’ needs and requirements.

The user is the third and most important component of the IA model. According to Morville and Rosenfeld (2006), users include respondents, visitors, actors, employees, customers, and more. Users in this model of IA are a very broad category. Morville and Rosenfeld do not discuss much about the cultural background of the users, however. Kamppuri (2011) discusses the cultural background and illustrates that cross-cultural UX research has studied users differently over time, identifying three waves of UX studies. In the beginning of 1980s, during the first wave of human-computer interaction, researchers recognized that there was a need to “look at users in a different light ... [in which] the centre of a system is a user” (Kamppuri, 2011, p.16). Thus, in this first wave of human-computer interaction, engineers looked at users in a different light with the computer as the major tool of investigation. The second wave of human-computer interaction started to gain hold in the late 1980s, with a focus on research turning towards understanding users as individuals with different tasks and backgrounds. Now, during the third wave in the new millennium, when web access and computer use have become available to a far more diverse group of people, the basic challenge remains the same: how can users’ cognitive styles relative to information be transformed into meaningful information that can be used to enhance web accessibility.

3.3.2 Denn and Maglaughlin model of information architecture
The model of Denn and Maglaughlin (2000) articulates the elements of IA in a somewhat similar way to that described by Morville and Rosenfeld (2006). This model represents IA as the intersection of content, applications included in the architecture, the users using the content, and the context in which the system is used.

This model is based on the feedback of people who were involved in the study of modeling IA. The model of Denn and Maglaughlin (2000) provides a general framework of IA. Figure 7 illustrates the aspects of context, contents, and users, provided by Morville and Rosenfeld (2006). Contents not only refer to the data but also the knowledge users gain from the information. The left side of the figure shows users and users’ relations to the information. The right side of the figure shows the IA of the website. The right side of the figure explains how the design of IA such as structure, tags, classification, and models and their implementation helps to present information in terms of data and knowledge.

![Figure 7: Model of IA by Denn and Maglaughlin (2000)](image)

The models of Morville and Rosenfeld (2006), and Denn and Maglaughlin (2000) describe IA as a field of study. By engaging in studies of IA, a website gets its structure. The structure
of a website is thus the product of an IA process. One question that needs to be asked, however, is how much these models take into consideration the cultural context of IA. Morville and Rosenfeld highlight cultural context in the user component of their model, arguing that users from different cultures prefer different modes of information representation. Denn and Maglaughlin (2000) explain IA as intersection of contents, applications, and users. This model opened some discussion and communication between academics and practitioners, but there was no follow up work.

3.3.3 Critical reflection on the concept of IA

In HCI, researchers have discussed the IA of websites in a variety of different ways (Allen & Boynton, 1991; Danaher et al., 2005; Dong et al., 2001; Duncan & Holliday, 2008; Isa et al., 2006, 2007, 2008, 2009b, 2009c; Kim et al., 2005; Mvugi et al., 2008; Petrie et al., 2011; Rahim et al., 2006; Rau & Liang, 2003; Toms, 2002). Issues addressed include the use of information system architecture for organizational support (Allen & Boynton, 1991), information interaction (Toms, 2002), designs of information structure for behavior change websites (Danaher et al., 2005), understanding mobile context (Kim et al., 2005), and the design and evaluation of library websites (Duncan & Holliday, 2008; Mvugi et al., 2008). Other aspects of IA studied include the issue of internationalization versus localization (Rau & Liang, 2003), and frameworks and models for IA (Isa et al., 2009c; Rahim et al., 2006). Gullikson et al. (1999) talk about IA from an interface design perspective and state that IA refers to the how factor in that it concerns how information is categorized, labeled, and presented, and how navigation and access are facilitated.

Companies that intend to conduct international business on the web should consider the impact of culture on the understanding and use of web-based communication, content, and tools (Marcus & Gould, 2000). The growth of the internet and improvements in the design of web content have also led to changes in the structuring of the web. The information structures of websites are no longer solely hierarchal but are also hybrid (Danaher et al., 2005). In the hierarchical design of information architecture, the information is organized in a top-down manner so that the user can review increasingly detailed contents. A hybrid design is composed of multiple information structure designs that best fit content and purpose (Danaher et al., 2005).
Gullikson et al. (1999) have argued that users do not come to websites for an experience, yet these websites arguably invest more into the look and feel of their contents than into the architecture structuring how the contents are presented. The labeling of web contents has a major impact on the UX of websites. Gullikson et al. (1999) have pointed out that users often cannot find the answers to common questions on a website when it is not well structured. The lack of navigation and labeling of concepts on a website clearly impacts on its UX. Duncan and Holiday (2008) believe that the IA of websites requires a rigorous process that involves interaction and redesign to improve UX and user satisfaction. Such interaction and redesign is helpful only if the information is complex and cannot be conceptualized by the users in a card sorting experiment.

In terms of information structures, three key web-matrixes are important and must be considered for the efficiency of websites: depth, centrality, and connectivity of information (Wang et al., 2007). In term of structure of pages, Walton et al. (2002) questioned whether the Western hierarchical tree, as seen in traditional file structures, web structures, and databases, is suitable for South African users. The study found that there were considerable differences in the hierarchical file structure of files on computers and websites. Their study suggested that although South African students did not have problems navigating such tree structures, its hierarchical meaning caused them difficulty. The visual conventions used to express tree structures in the layout caused problems, for example.

Studies have used different approaches to evaluating the information hierarchy of websites. Such approaches include hyper link analysis (Henzinger, 2005), Markov Chain analysis (Kitajima et al., 2005; Sarukkai, 2000), card sorting analysis (Curran et al., 2005; Hudson, 2005; Hurd, 2002; Liang & Yang, 2008; Nielsen, 1995; Petrie et al., 2011; Rugg & McGeorge, 1997).

Reflection on the IA literature tells us that researchers, UX analysts, and designers agree that the IA of the web influences performance. In order to improve the performance of websites’ IA, knowledge of demographic diversity should be acknowledged. In conclusion, my concept of IA in this thesis mainly focuses on the structural design of information on websites and how it is related to users’ cognitive styles and the context of use.
3.4 UX of websites

In the last decade, UX has emerged as an umbrella term to describe the usability and quality of use of interactive products and systems. Empirical research and practitioners have started using UX as a grounding concept instead of usability. Early researchers in UX viewed existing usability research as overly focused on effectiveness and efficiency and felt a need to place more emphasis on the quality of experience. UX thus looks more into hedonic qualities of use and is concerned with, for instance, aesthetics and self-actualization (Bargas-Avila & Hornbæk, 2011). The International Standards Organization (ISO) defines user experience as: “a person’s perceptions and responses that result from the use or anticipated use of a product, system or service” (ISO 9241-210, 2010). Kurosu and Kashimura (1995) initially pointed towards the aesthetics aspects of usability and found that apparent usability was more strongly affected by the aesthetics than inherent usability. Since then, researchers have investigated that a system’s aesthetics may also affect post-use perceptions of the system’s usability, whereas its actual usability may have no such effect (Tractinsky, 2004; Tractinsky et al., 2000). UX is the totality of the effect or effects felt by users (Hartson & Pyla, 2012). While looking into the aesthetic and emotional aspects of UX, this aspect is not completely new as it was to some degree traditionally covered under the heading ‘user satisfaction’ in the ISO usability definition.

There are further aspects of UX that have been critiqued. One of the major points of criticism of the use of the UX concept is that UX considerably depends on subjective experience. I use UX as an umbrella term to discuss different cultural usability issues that includes aspects of users’ emotions and aesthetics related to the information structure and information classification of website contents. Garrett (2010) proposed that UX in its totality has five main elements. These elements are strategy, scope, structure, skeleton, and surface. The strategy incorporates what the institutes or companies want to get out of the website and what the users want to get out of the websites. The scope defines feature and function the website holds together. The structure includes the placement of information on websites. The skeleton includes the placement of buttons and tabs. The surface includes the placement of texts and images. These elements of UX are ordered from abstract to concrete.
Usability has been studied for the last three decades (Carroll, 1997). The idea of usability came into discussion when information systems and terminal work-stations began to be used by end-users and it were no longer considered as a product only for designers and engineers (Shackel & Richardson, 1991). This change in the nature of computing brought changes to practice as well. Now, designers and practitioners in industry employ the definition of usability in ISO9241-11 as standard practice. The standard defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”.

Effectiveness refers to the accuracy and completeness with which users achieve specified goals. Efficiency refers to the resources expended relative to the accuracy and completeness with which users achieve the goals. Satisfaction is users’ comfort and positive attitude towards the use of the product. Context of use includes many factors such as users, their goals, tasks, equipment used for goals and tasks, and the physical and social environment in which the product is used. (Bevan, 1995; Frøkjær et al., 2000; Hertzum, 2010; Nielsen, 1993)

The term ‘usability’ has become so general that it is generally used without definition in HCI studies. Therefore Hertzum (2010) states that rather than one meaning of usability, there are multiple images, comprising universal usability, situational usability, perceived usability, hedonic usability, organizational usability, and cultural usability. He further argues that in order to address multiple images of usability, there is a need for supplementary methods to address long-term aspects of usability. From an “images of usability” perspective, I focus more on the image of cultural usability, as cultural usability is aligned with the topic of research in this dissertation. Cultural usability focuses on the usability of systems aligned with the cultural background their users (Clemmensen et al., 2007; Clemmensen, 2011, 2012). The cultural usability also takes users’ background information into account therefore cultural usability suits with my view of argument for usability. For example, use of symbols and language that is meaningful to users from a specific culture. The image of cultural usability portrays important issues subject to users’ cultural background. For example, the image of usability for Islamic websites may vary for a Muslim user. An Islamic website’s usability tends to focus more on content validity and the source of the contents rather than emphasizing the interface design itself.
In summary, I will relate website UX with users’ cognitive styles, contexts of use, and the information structure of local websites. This will help to explain how a good fit between a website’s IA and a user’s view of website structure can lead to better UX. I focus on the image of cultural usability, as cultural usability is aligned with the topic of research in this dissertation.

3.5 My theoretical approach

Figure 8 presents a theoretical approach of the relationship between IA and UX. This framework demonstrates the ideal situation of website UX in which users’ cognitive style and context of use are aligned with the information architecture of a website. In relation to the ideal situation of UX of local websites, the critical practice of UX for local websites demonstrates that information architecture may not be aligned with the users’ cognitive style and context of use.

Cognitive style is an individual’s typical way of thinking, processing and organizing information, solving problems and learning. It explains individuals’ habitual approach to organizing, thinking, and remembering information (Dong & Lee, 2008; Ford et al., 1994). For example, an East Asian may often explain an event with reference to its context (Masuda & Nisbett, 2001) and thus may expect to take the context of the information into consideration in order to remember the information structure of a website.

Figure 8: The ideal situation of UX in local websites (left) and the critical situation of UX in local websites (right)

The context of use may also contain shared knowledge. Shared knowledge consists of patterns generally practiced in the local cultural setting and reflects the knowledge
structures that are common in a particular part of the world. The shared knowledge practiced in a society is generally shared but the degree may vary within a geographical boundary. For example, cultural groups maintain systems of meaning that are understood within that group. This shared knowledge includes the maintenance of group identity. In terms of website structure, it may include items that are considered related to each other in a cultural setting.
4 Philosophy of science in this dissertation

This section discusses the research foundation of this dissertation. Research of all kinds follows some school of thought that entails a set of assumptions and beliefs about its legitimacy and reliability. Specific schools of thought lead towards particular research foundations and methods that are considered appropriate to the examination of a particular phenomenon. It is therefore important for researchers to understand, acknowledge, and justify the philosophical assumptions underlying their research and methods.

4.1 Research foundations

The discipline of information systems adopts theories from different fields, such as organizational behaviors, psychology, anthropology, computer science, and marketing (Vessey et al., 2002; Weber, 1999). Baskerville and Myers (2002) share the view with other IS researchers that information systems is an applied discipline drawing upon other, more fundamental, reference disciplines. In a similar way, the field of HCI takes theories from psychology, anthropology, computer science, ergonomics, and linguistics (Carroll, 2003; Lazar et al., 2010), and it is also an applied science. To some degree there is an overlap between HCI and IS.

Van de Ven (2007) provides four alternative philosophies of science applicable to research. He describes these foundations as: positivism, relativism, pragmatism, and realism. The foundation of positivism comes from a group of mathematicians and scientists who were called the Vienna Circle (Van de Ven, 2007). Guba and Lincoln (1994) called mathematics the ‘queen of sciences’ in their famous article about competing paradigms. Positivists assert the existence of a physical and social world independent of humans and state that researchers can discover this world through measurement and observation. The role of the researcher is to be neutral and objective while conducting observations in the positivist paradigm as facts can and should be discovered independent of the researcher’s personal values and beliefs (Oates, 2006). Logical positivism, within positivism, constructed the role of philosophy as the analysis of science from a logical perspective using a language of
verifiable propositions. According to Suppe (1977), logical positivism adopted instrumentalism, which denies that theoretical terms have any referential value.\textsuperscript{19}

There is much discussion of the inadequacy of logical positivism and Suppe (1977) provided an extensive summary of criticisms. Reichenbach (1948), who is also one of the pioneers of logical positivism, argued that it could not solve the problem of induction and consequently explain the predictive nature of science. Hanson (1958) argued that causation, which is an important component of positivism, is not a property of the physical world, but is rather a way that people make sense of the world.

Alternate philosophies of science emerged in reaction to positivism. Van de Ven (2007) called these approaches \textit{relativism}. All perspectives in the broad category of relativism break away from the positivist assumption that knowledge is a cumulative, unmediated, and complete representation of reality. Broadly speaking, an ontological perspective of relativism holds the view that reality is socially constructed (Van de Ven, 2007). There are many alternative philosophies within relativism, including historical relativism, social constructivism, post-modernism, critical theory, and hermeneutics. Toulmin (1953) and other historical relativists argue that scientific knowledge is socially constructed (see also: Alexander & Colomy, 1992). One of the historical relativists, Kuhn (1962), claims that scientific knowledge undergoes periodic ‘paradigm shifts’ rather than progressing in a linear and continuous way, and that these paradigm shifts open up new forms of understanding that scientists would never have considered valid before. Kuhn argued that the notion of scientific truth at any given moment cannot be established solely by objective criteria but rather that scientific truth is defined by a consensus of a scientific community (Kuhn, 1962).

An alternative philosophical foundation emerged in late nineteenth century from American philosophy. Peirce (1905) introduced pragmatism, a term which can be traced back to the Greek word for ‘action’ (Peirce 1905, pp.161-181). Pragmatism sought to reconcile rationalism and empiricism by showing that knowing and doing are part of the same process (Van de Ven, 2007). It describes a process by which theory is extracted from

\textsuperscript{19} Referential value refers to the existence of unobservable entities in physical world, which are represented using theoretical terms in science.
practice, and then reapplied to practice. Within pragmatism there are different positions such as radical empiricism and realist pragmatism. The realist stance of pragmatism states that there is no reason to believe that a mind-independent reality does not exist.

Finally, Van de ven (2007) explains realism as a fourth alternative research foundation. Realism contends that there is a real world existing independent of our attempts to know it. There was a major criticism of scientific realism by relativists who questioned the belief in absolute truth and approximation. In response to this criticism, several variations of realism developed. These alternative views included conjectural realism, pragmatic realism and critical realism. I further include instrumental realism as a fourth alternative research foundation. Instrumental realism is at the most general level the view that the world described by instruments is the real world and is independent of what we might take it to be. The view of instrumental realism is different from instrumentalism. Instrumentalists do not regard the existence or unobservable. The instrumental realist regards the existence of un-observables phenomenon (Ihde, 1991).

4.2 Ontological standpoint of this dissertation

Generally, an ontological perspective is an explicit formal specification of how to represent objects, concepts, and other entities that are assumed to exist in some area of interest. On a broad level, ontology explains the nature of phenomena. The question of the ontology of a website’s structure is an interesting phenomenon because website structures are not visible to humans. At the same time, users’ views and conceptions of website structures are present in their minds.

This research is approached according to a realist view of the world and more specifically adopts a conjectural realist position. Conjectural realism is a moderate realist position, which was developed by John Worrall (1982). The conjectural realism is based on the historical facts that scientific theories have changed radically and revolutionary in the course of their development. This approach acknowledges the chances of wrong interpretation and understanding of the world. The conjectural realist argues that our current theories might not be absolutely true. We are, however, still interested in finding a truth that is general. The approach of the conjectural realist is a variation of the historical realist standpoint, which states that there is a real world that exists independently of our
attempts to know it (Van de Ven, 2007). The conjectural realist approach came after major criticism of scientific realism’s assertion of the existence of unobservable entities beyond human perception. “These unobservable ontologies can be linked to three schools of thoughts such as Instrumentalism, Realism, and Approximations (historically known as conceptualization)” (A. Van de Ven, 2007, p.58). The first school of thought, instrumentalism, does not accept the existence of anything unobservable and does not regard such entities in scientific theories as a means to explain observable phenomena. In contrast, realism accepts the existence of unobservable entities and that scientific theories can reference such entities.

In contrast to positivism and relativism, scientific realism contends that science develops statements that are true at both the theoretical and observational levels of phenomena. While looking into users’ cognitive style and comparing it with UX of websites, it is argued that users’ cognitive style is embodied in the culture of the users and is developed from the anthropological and psychological theories of culture. These theories of culture argue that users’ understandings of the world are influenced by their education and environment during their childhood. This dissertation contends that there is a reality that exists in term of users’ cognitive style in a culture. This reality, regarding users’ cognitive style, may change over a period of time from one to another. A certain instance of a website structure in a user’s view is the reality of users’ cognitive style at that moment. This reality is at an abstraction level which changes over a period of time for everyone.

Figure 9: Realistic perspective, adapted from Rauterberg (2000)

Figure 9 is adapted from Rauterberg (2000) who explains the reality of a situation from one time to another time. At one time scientists might have a good reason to believe the
The research in this dissertation takes the conjectural realist’s perspective, because despite having a good reason(s) for belief in the existence of an entity or in the truth of a scientific law, our interpretation of reality might be wrong. In this regard, users’ cognitive style in a country or cultural group represents the reality of websites within that group. This reality is reasonably stable for some time. On the other hand, our goal is to always strive for reality.

4.3 Epistemological Consideration for Studied Phenomenon

How do we understand a user’s cognitive style? I argue that users’ cognitive style is a complex phenomenon and that it is necessary to look into different aspects that might explain it. Information classification activities such as card sorting can assist in understanding some aspects of the cognitive style. Further, users’ activities of information retrieval and feedback can help to understand their cognitive style. In order to understand the extent to which users’ cognitive styles can be explained, I argue that users’ classification activities (card sorting) and information retrieval activities can help to understand users’ cognitive style. Information classification is a way of asking people to do something instead of stating how they think.

Figure 10: Philosophical positioning of dissertation, adapted from Van de Ven (2007, pp.53) and communication with Suprateek Sarker

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Suprateek Sarker (http://www.cb.wsu.edu/directory/profile.cfm?emp=sarker_suprateek) is professor of information Systems. Figure adapted in a communication in a PhD course on philosophy of science.
The positioning of the dissertation from a philosophical perspective explains the epistemological and ontological standpoint of this dissertation. Figure 10 shows that this dissertation has been approached through objectivist and inductive dimensions, along with some interpretation. This situation is well aligned with Deetz’s (1996) view where he discusses the traditional epistemological version of paradigms developed especially by Burrell and Morgan (1979). Deetz (1996) argues that representation, in a single quadrant, is too rigid and representational. It is too founded in an objective/subjective distinction, and too easily taken as being “true” (or perhaps “false”) rather than simply more or less stimulating or interesting.

In summary, the conjectural realist is the ontological position of this dissertation because components of my theoretical understanding explain the temporary snapshot of users cognitive style through information classification activities. In my view, this reality, in term of users cognitive style, remains consistent for a stable period of time. At the same time, our understanding of reality can be wrong, but we always strive to get to the reality. The epistemological position of the dissertation has been approached through objectivist and inductive dimensions, along with some interpretation and epistemological position. Applying Witkin (1967) and Nisbett (2003) view of cognitive style, I assume that cognitive style is stable for some time, this allows me to study my topic as an empirical phenomenon.
5 Empirical research

5.1 Research design

Choosing an appropriate method is context dependent and each method has its own strengths and weaknesses. This dissertation approaches the issue of UX in website use from several angles simultaneously, adopting a mixed-method (Creswell, 2009) or methodological pluralism (Sankey, 2008) approach. Such an approach is desirable and feasible in this research because it allows for the investigation of different dimensions of a real situation, including the social and personal (Mingers, 2001). “In methodological pluralism, scientists apply a number of scientific methods and rules for alternative theories and acceptance of results” (Sankey, 2008, p.110).

In order to achieve the research goal and answer the research questions, a two-step experimental design methodology was developed. The first part of the research investigated whether participants’ views of the UX and structure of websites were consistent or different across two different countries, Denmark and Pakistan. In the second part of the research I wanted to confirm what I found in Pakistan by comparing it with Malaysia with the expectation that both participants groups would behave similarly when using local websites. Brainstorming, card sorting experiments, information retrieval tasks, and the retrospective interviews were conducted throughout the research. In total, 108 participants were recruited in four studies. Three participants were used in pilot studies in each study.

In order to address different theoretical aspects of this study, a range of activities were used. Figure 11 provides an overview of the data-collection model. Information regarding different concepts was attained through number of activities.
Cognitive style is an individual's typical way of thinking, processing, and organizing information. Cognitive styles of users are primarily captured through activities of information classification through card sorting.

I see classification activities as a way to understand users' cognitive style in a given culture. In my view, cognitive style may change over long periods; I assume it remains stable for a reasonable period within a culture. The psychology studies use personality questionnaire and interviews to understand the cognitive style (Kozhevnikov, 2007). This study acquires users' cognitive style through information classification activities. My perspective of acquiring cognitive style makes it important to perform empirical research on website UX and, in my view, classification activities such as card sorting, and user interaction studies can be used as a way to understand cognitive style. My perspective of cognitive style will use classification activities as a way to explain empirical data resulting from users' card sorting.

In order to initiate the process of understanding cognitive style, different data collection activities were designed in four studies (see section 5.2). The data collection activities were those such as open card sorting, in which participants are provided with the contents of the webpage and are asked to group it into suitable categories, and a card-based brainstorming activity (see section 5.5) in which users are provided with a scenario about a website and then asked to write the contents of the website and group names on pieces of blank card.

In this thesis, the concept of classification is used as a way to capture users' cognitive styles, i.e. as an empirical concept that covers the data collection with card sorting.
methods. However, the concept itself may require some introduction, since it has been used as a theoretical concept in many areas of study, including information management, medicine, anthropology, psychology, and mathematics. It stands at the crossroads of the sociology of knowledge and technology, history, and information science. From a traditional information science perspective, the general goal of classification research has been to create a single best classification system that suits everyone everywhere (Miksa, 1998). Contemporary classification research focuses on contextual information as a guide for the design of information schemes (Mai, 2004). My perspective on classification is more aligned with this new research tradition. It focuses on studies of participants’ information interaction. It takes classification models as a base to explain classifications that users make during their interaction with websites, and it relates these to users’ cultural groups.\textsuperscript{21}

Classifications and categorization are sometimes distinguished from each other. Classification is “an act to organize a set of entities; a set of rules is therefore set up to determine when an entity goes into a particular class” (Mai, 2011, p.712). Therefore classification activities may be rigorous concerning whether an entity either is or is not a member of a particular class. Categorization, on the other hand, is the “process that involves named entities in the world and the process of grouping them into categories” (Mai, 2011, p.712); the process of categorization is performed without any framework. There are however many similarities between classification and categorization, and there are examples of literature using these two terms “…indiscriminately to refer to the same process” (Jacob, 2004, p.527), which is what I do in this thesis.

\textbf{5.1.2 Context of use: domain of website, information retrieval, website language}

The context of use consisted of users’ tasks and equipment (hardware, software, and materials), and the physical and social environments in which a product was used. In order to focus on the context of use, all the participants were provided with facilitating conditions for UX studies.

The domain in the first two studies was university websites. The domain in studies 3 and 4 was e-commerce websites. Studies 1 and 2 were conducted at the same university and the

\textsuperscript{21} The discussion of and differences between cultural group, ethnic group and regional group are explained in section 3.1.1.
content for that same university were used in the studies. For studies 3 and 4, the 
appropriate local e-commerce website of each country was used (See Appendix 4).

English language contents of the university website in Pakistan were used for study 1. The 
website only provided content in English. English language content was also chosen for the 
second study of a university website in Denmark. The university website showed the same 
information in both English and Danish. English language contents were chosen because 
the researcher had limited knowledge of Danish. The e-commerce websites in studies 3 
and 4 provided information only in English. The contents were not presented in native 
languages on either website. The contents were also presented in English because users of 
the studies had different native language. English language could have been commonly 
understood and in most cases it was not possible for all users to understand more than one 
native language.

Information retrieval tasks were set for the participants in the studies to understand their 
approach to finding targeted information. During these tasks, participants were asked to 
search for information in different parts of a website. These tasks thus tested the 
navigation design and structure of the website. The evaluator made notes while 
participants looked for information, summarizing the participants’ activities as well as 
noting their success rate. Information retrieval tasks provided an understanding of a 
participant’s path to the required information. Creating a task list is one of the more 
challenging parts of studies. A task list is needed for usability studies. An example of such a 
task:

*Please find the contact information of the person/secretary who can provide you 
  further information about Hostels. Please notify the instructor when you finish.*

There were between four and five information retrieval tasks in each of the studies. The 
order of the tasks was changed each time to control and minimize the learning effect. A 
time of three minutes was provided to the participants to complete each task. The 
approximation of time was calculated through a pilot study by exploring all information on 
the website.
5.1.3 **Information architecture: Website navigation and website labels**

In websites, the simplest way to organize information is according to a sequential website structure. In such a linear design, pages and other information are organized in a sequence and accessed in a sequence as well. A sequence structure might be arranged in alphabetical order or numerical order for example. Danaher et al. (2005) called this type of design a ‘tunnel design’. Such simple sequence designs are often used in educational websites or other websites that follow a linear sequence of information. In a complex linear sequence design, navigation is facilitated through links to other linear sequence designs, which are related to the first design. Lynch and Horton (2009) called this type of sequence a 'linear digression sequence'.

In a central or hub structural design, all webpages are linked to a single, central webpage. Central or hub design is followed in websites when all the abstract information is placed on a single webpage and users can go to the next level for detailed information. Navigation is centralized and the hierarchy is simple. In terms of depth of hierarchy, we find only the first level of sub-categories of information.

In websites with a single homepage, a hierarchical design is general practiced to organize information into different orderings. In a hierarchical design, the contents of a website follow a certain hierarchy. Information is placed at the different levels of hierarchy. Hierarchical design of websites is commonly applied in website practice because many of the users are familiar with it.

Most websites use a matrix design. In a matrix design, information is organized in different categories and most of these sub-categories are interlinked through web-links. Danaher et al. (2005) explain hybrid design as a combination of the previously discussed designs. Hybrid designs allow the users to use information interactively without the strict navigational patterns that can result from some of the other designs. Figure 12 shows different types of website structures.
Website labels are descriptive text used to explain the contents linked to the label. Labeling is a form of representation of information. For example, "Contact Us" is a label that represents a chunk of content, often including a contact name, an address, and telephone, fax, and email information. Information on websites cannot be presented quickly and effectively without providing labeling. In order to make information easily understandable for users, information architects should speak the same language as website’s users do while reflecting its content.

5.1.4 **UX issues**
Participants were asked to rate the usability of the websites on a Likert scale to find general problems for a usability assessment. The UX issues included: ease of use, attractiveness of design, ease of finding information, information accuracy, and usefulness of the website. The participants also provided their feedback in feedback sessions regarding the general UX issues of websites. The feedback sessions provided an ability to go deeper into the logic of providing usability assessment rating.

5.1.5 **Relationship between empirical studies 1, 2, 3, and 4**
The relationship between studies 1, 2, 3, and 4 is of a longitudinal nature. Each of the studies provides an input to the next study, building upon the learning from one study to the next.

Studies 1 and 2 of the research were designed to understand the study area in depth through a comparative study in two geographical locations. Study 1 had a more exploratory
nature. In study 1, I started to explore the nature of website structure through card sorting methods. Studies 1 and 2 emphasized emergent factors related to website IA. The participants' feedback was analyzed through activities of brainstorming, card sorting, and usability testing. Two locations, Copenhagen, Denmark and Lahore, Pakistan were used to understand the nature of emergent factors. The selection criterion for location and groups in the study was initially based on the cultural cognition theory. Study 1 uses the analytical framework outlined in section 3 to understand the factors within and across studies 1 and 2.

![Figure 13: The sequence of the four studies](image)

Studies 1 and 2 showed that there were cultural preferences in website IA. The language choice was another emergent factor raised in the comparison of study 1 and study 2. The between-groups analysis of studies 1 and 2 showed differences in information finding during the task analysis of the study. The studies also raised an important methodological issue in the study design itself. It used two groups of participants with two websites for pragmatic reasons, because selecting a single website would make it biased toward one of the two groups. The local websites were selected to understand the factors mentioned by the participants of each group. Study 1 showed interesting results using local websites for the information structure and information retrieval tasks. The themes found in studies 1 and 2 were used to conduct two further studies. Studies 3 and 4 used local e-commerce websites. A sample image of each of the website is provided in appendix 4. In studies 3 and 4, participants' language preferences were included. In addition to the usability tasks such as card sorting, information retrieval, and brainstorming, participants were interviewed at the end of every session to understand general website usability issues.

### 5.2 Participants
Figure 13 shows the number of participants, the number of information retrieval tasks, and the domain of websites in our studies.

![Diagram showing number of participants and tasks](image)

**Figure 14**: Participants and their activities in studies 1-4

### 5.2.1 Selection of Participants

Students were recruited as the main participants of the study because young people such as university students commonly use the internet for a variety of purposes.

Determining the number of participants to recruit for research is subject to a trade-off between the information requirements of the study and the cost of conducting it. In studies of card sorting, participant numbers have varied from 5 to 90 (Tullis and Wood, 2004). The studies in this research used between 17 to 41 participants, and included participants used for pilot studies. Thus, the studies presented here are comparable with other studies conducting similar kinds of research. Nielsen (2004) argues that five users are generally enough to test the usability of a website. Nielsen (2004) states that for card sorting, test at least 15 users - 3 times more than you would in traditional usability tests.
Tullis and Wood (2004) argue that for a card sorting study, collecting data from 5 users do not provide good result. However conducing study with 15 participants yields good result. Studies with as few as 12 participants are common in HCI, but results with 20 or more users are more convincing (Lazar et al., 2010).

5.2.2 Recruitment of participants
Participants were recruited four times in the three locations in Denmark, Malaysia, and Pakistan. Data was collected each time on participants’ gender, ethnic groups, age, and internet use. Additionally, information regarding language proficiency and language use on the internet was collected in studies 3 and 4. The details of the recruited participants and their background information are provided in results section.

5.2.3 Website navigation and website labels
The website labels were taken from local websites in each study. Each website contained many labels on each webpage, and therefore a section of each website, a number of pages, was selected and all labels in that section were noted down. Table 3 provides a sample of labels that were used in study 2 of the university website in Denmark. A complete list of cards is included in Appendix 3.

| Sample of labels used in study 2 |
|-----------------|-----------------|-----------------|
| Quality         | Campus Facilities | FAQ             |
| Find Us         | Jobs at University | Opening hours  |
| Summer University | Accommodation     | Students going Abroad |
| Photos          | Scholarships      | For Companies   |
| Study Help      | Study place and rooms | Library cards |

The websites in the four studies used a variety of labels. The usability studies used the same labels that were used by websites in all fours studies. These labels were extracted from the websites and provided on cards to be arranged by the users.

5.3 Instructions and tasks
Creating task lists is an important part of a UX study. Tasks were chosen on the basis of goals (Dumas & Fox, 2009). The goal of information retrieval tasks was to understand how
much time participants needed to find information and what strategy was used to do so. For example, participants were asked to “find the wireless remote control doorbell on the website”. They were asked to notify the instructor when they finished the task.

The goal of card-based brainstorming was to provide an opportunity for the participant to create the contents and then organize it into different groups. For example, participants were asked to think about the home-appliances section of an e-commerce website, and to determine what kinds of categories they could think of, and how do they would order them. On the basis of a scenario, users wrote contents related to that scenario and sorted it into categories.

The experiments were held individually and each participant took between 100 and 130 minutes to complete all activities. A total of approximately 230 hours was spent with the 108 participants in three countries in four studies. The data included open card sorting activities, information retrieval tasks, card based brainstorming, a questionnaire on the UX of websites, and interviews with the participants. In each study of the four studies, a pilot test with three participants was conducted to look into all the aspects of study design. A review of the study design was conducted after the pilot study to address the issues uncovered.

5.3.1 Stages in UX study
UX studies require considerable advance planning. Different authors describe different steps and stages of a UX study. A UX expert or test leader may take the role of the UX moderator and manage this process. Table 4 provides a list of stages that the author used in the UX studies.

<table>
<thead>
<tr>
<th>Stages of UX in studies</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Decide what type of data to collect</td>
<td>6. Conduct the test sessions</td>
</tr>
<tr>
<td>2. Develop a test plan</td>
<td>7. Debrief the participants</td>
</tr>
<tr>
<td>3. Prepare test material and</td>
<td>8. Analyze data and observations</td>
</tr>
<tr>
<td>4. Select representative users</td>
<td>9. Report findings and recommendations</td>
</tr>
<tr>
<td>5. Setup the test environment</td>
<td></td>
</tr>
</tbody>
</table>
The studies used a combination of the UX stages described in table 4. The studies did not use the strict ordering of the UX stages, but rather changed them to our convenience. For example, after developing the test plan, test material was prepared before setting up the test environment. The data analysis of the tests was conducted in two stages. In the first stage, the initial data was analyzed for further studies as well as reporting in papers. In the second stage, the data was analyzed during the writing of this dissertation.

5.3.2 **Role of test leader**
A test leader or moderator is a person who helps with the conduction of experimental research. Thus, a test leader might conduct a card sorting experiment and an interview afterwards. There are some specifications a person should comply with in order to be a moderator or test leader of a study. They should be familiar with general user interface design concepts, should have conducted or been a part of UX experiments before, and should be fluent in both local languages and in English in order to explain difficult concepts across languages. In the experiments described here, I acted as test leader throughout the data collection.

5.4 **Card sorting in HCI**
Currently, card sorting is used in HCI studies to sort and group objects and concepts in order to both test and aid in the design of products. Cards typically contain information such as screen shots of webpages, contents taken from web systems, or relevant concepts for users or experts to group. Card sorting can be conducted either physically or by using online card sorting applications and systems. Card sorting helps to understand the terminology people use, to identify categories and their commonalities and differences, and to understand relationships such as distance and proximity between the items sorted.

This study used card sorting as the main activity of UX evaluation during data collection. UX testing generally involves studying representative participants performing representative tasks in a representative environment (Lazar et al., 2010). While relating approaches in UX studies with traditional research methods, Lazar et al. (2010) describe these approaches as closely related to other research methods. That is, the approaches followed in UX are often the same as or very similar to those used in classical research. It is also important to point out that in UX testing qualitative data is often just as important as quantitative data. Such data is collected through activities such as brainstorming, card
sorting, information retrieval tasks, and retrospective interviews. The combination of these activities provides rich data and can lead to a deep understanding of different aspects of cross-cultural UX for websites.

One of the primary reasons for choosing card sorting as a method for data collection is that it provides an insight into how participants classify information. Card sorting is also widely used as a user-centered design technique in HCI studies because it is simple method and can be easily be understood by users (Deibel & Anderson, 2005; Donna Spencer, 2009; Rugg & McGeorge, 1997). Further, focusing on methods such as surveys, questionnaires, interviews, and focus groups would not necessarily provide such a direct insight into users’ cognitive styles. It is difficult to observe what is in a user’s head in a particular culture using other methods. Card sorting provided a way to understand users’ mental models of content structure, which otherwise is difficult to capture.

5.4.1 Card Sorting
Card sorting is a technique aligned with Kelly’s (1992) personal construct theory. It assumes that people make sense of the world through classification and that people can describe their own classifications with reasonable validity and reliability (Kelly, 1992; Rugg & McGeorge, 1997). The protocol of card sorting is to ask participants in interviews or workshops to sort labeled paper cards into piles. Card sorting can be applied to any of a wide variety of activities that involve grouping and naming objects or concepts. Card sorting is useful and suitable in cross-cultural research because it does not involve a complex system of information that participants need to learn before participating in experiments. Card sorting was primarily used for this research because it is simple and easy to understand for participants while also providing rich data regarding their cognitive styles.

Card sorting has a long history in social science research where it is known as pile sorting, free sorting, classification, and grouping. Ancient Greeks are attributed with early development of categories (Hudson, 2005, 2012). For instance, Aristotle provided the foundation for our modern scheme of categorizing plants and animals. In the nascent field of psychology, printed cards were used for a variety of experiments (Hudson, 2012; Jastrow, 1898). Jastrow (1898) used the approach to investigate characteristics such subjects’ speed at sorting cards into categories. This was then used as an indicator of users’
mental processes and reaction time for the activity. Card sorting began to be used in human-computer interaction in the late 1980s to evaluate menus and to capture users’ point of view (Mehlenbacher et al., 1989; Palmer et al., 1988).

Card sorting is a widely used technique in UX studies for assessing users’ perceptions of website UX, navigation, and structure (Hinkle et al., 2008; Hurd, 2002; Liang & Yang, 2008; Nielsen, 2004; Petrie et al., 2011, Spencer, 2009). Data collected through card sorting can be analyzed with both quantitative and qualitative techniques.

Card sorting is often related to affinity diagram (or the “KJ method”), which is primary used in user, business, and marketing research (Spool, 2004; Tague, 2005). A Japanese professor, Jiro Kawakita, devised the notion of affinity diagrams in the 1960s (Kawakita, 1991). Affinity diagrams are a simple way of organizing concepts by finding a relationship between them. In this method, a designer or expert writes down ideas on a set of cards and then organize the cards by grouping them and by placing closely related concepts close to each other.22

5.4.1.1 Open Card Sorting

In this research, open card sorting was used. In open card sorting, participants are provided with the contents of a webpage and are asked to group it into suitable categories. Open card sorting thus establishes a user’s own views on the groupings and hierarchies of the information. As this research suggests that participants in different locations may have different understandings of the groupings, card sorting was intended to help to reveal these localized meanings and understandings.

5.4.1.2 Card-based Brainstorming

Card-based brainstorming is an attempt to understand users’ understandings of the structure of information when provided with a scenario in the web domain. In card-based brainstorming participants are asked to provide contents and group them. They are provided with a scenario of a website and then write the contents of the website and group names on pieces of blank card. The situated nature of card-based brainstorming provides valuable information about the participant’s patterns of knowledge expressed through terminology, perceived relationships between different categories, and views of higher order categories.
5.4.2 Retrospective Interviews
Participants in each study were asked after each task to express both their thought processes during the task and their views on the task itself. Participants’ views were recorded and notes were taken. During the retrospective interviews at the end of each session, participants were asked about general UX related issues that were noticed during the tasks. They were also asked about other issues that arose during the sessions. The retrospective interviews provided an ability to go deeper into specific areas of interest and helped in understanding the participants’ logic of completing a task in a certain way.

5.5 Data analysis
Data was analyzed through qualitative and quantitative measures throughout the studies. I will explain the data analysis for each of the activities performed in the studies.

For scenario-based card sorting activities, data was analyzed through a qualitative assessment of labels provided by the users. The number of categorizes constructed by each were counted. For studies 1 and 2, scenario-based card sorting was qualitatively assessed in taxonomical and thematic categorizations (Nawaz & Clemmensen, 2011). In the first
study, the use of language was also observed in the organization of information about the university website.

For the open card sorting I used the edit distance method to analyze the activity and labeling of users’ structures. Edit distance is a measurement of difference between two sequences. Edit distance was used to measure the similarity of categories in different sorts. The methodology of edit distance is explained in the following example.

Table 5: Measuring edit distance from Sort A and Sort B

<table>
<thead>
<tr>
<th>Sort A</th>
<th>Sort B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁ = {1, 2, 3, 4}</td>
<td>B₁ = {1, 2, 3}</td>
</tr>
<tr>
<td>A₂ = {5, 6, 7}</td>
<td>B₂ = {4, 5, 6}</td>
</tr>
<tr>
<td>A₃ = {8, 9, 10}</td>
<td>B₃ = {7, 8, 9}</td>
</tr>
<tr>
<td>A₄ = {}</td>
<td>B₄ = {10}</td>
</tr>
</tbody>
</table>

Table 5 shows the example of two sorts A and B, where 10 numbered cards are used. These cards are sorted into four groups: A = [A₁, A₂, A₃, A₄] and B = [B₁, B₂, B₃, B₄]. In Sort A, an empty group A₄ is included so that both sorts have same number of groups. Sort A can be converted into Sort B by moving cards in the same sort from one group to another group. Minimum sets of move are shown in Table 6. By moving 4 from A₁ to A₂, 7 from A₂ to A₃, and 10 from A₃ to A₄, edit distance analysis will help examine the difference in two sorts. Table 6 provides a step-by-step conversion of one sort into another sort. In the current example, table 6, the edit distance is three because three steps are taken to change one sort into another sort.

Table 6: From left to right, stages of converting one sort into another sort
In edit distance, for each matched pair, a number of mismatches can be tolerated. In the view of Diebel et al. (2005), an increase in the number of groups (for example A1, A2, ..., A15) results in more discrepancies between the groups, which increases the overall distance between the sorts. The current example, table 6, has two sorts, Sort A, and Sort B.

With a measurement of edit distance with of four sorts (for example A1, A2, A3, and A4), a distance of 7 or 8 might be appropriate because users have more options to place a single card which results in increasing the edit distance. For edit-distance, a ration scale is used to calculate the result of card sorting. The higher number shows that there is higher disagreement between the users. The agreement of the users is not only measured in the form of edit distance. The agreement of the users between each other is also shown in the form of a dendrogram. A dendrogram is a branching diagram that represents the relationships of similarity among a group of entities. The output of the dendrogram is based on a similarity matrix (Katsanos, Tselios, & Avouris, 2008a,b).
6 Results

This section provides the results of the studies conducted during the research. Table 7 provides a summary of results and how the papers attached are based on one or more one of the studies.

<table>
<thead>
<tr>
<th>Literature Review</th>
<th>Study 1 PK1</th>
<th>Study 2 DK2</th>
<th>Study 3 PK3</th>
<th>Study 4 MY4</th>
<th>Card-sort Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 2</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 3</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Paper 4</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

6.1 Literature review study

The literature review study looked into the nature of website UX in Asia (Nawaz & Clemmensen, 2013). The results of the study are presented in the first paper – Website User Experience in Asia ‘From Within’: An Overview of a Decade of Literature. This study conducted a systematic literature review of website UX research in Asia from 2001-2011 and looked into the nature of website UX studies in term of topic, use of theory, and research methods (Nawaz & Clemmensen, 2013).

The analysis of the literature review shows that website use is becoming a normal part of daily life in the region due to developments in IT infrastructure. However, the majority of research studies in HCI have been limited to studying users in the United States, Canada, and European countries, or presenting a comparison between one of these countries and countries in Asia (Clemmensen & Roese, 2010).

The review revealed that in Asia, the studies of website UX have been increasing. Figure 17 illustrates that there was indeed an increase in publications on website usability in Asia during the investigated period of time, as mentioned in propositions of the study. 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 17 shows that publications on website usability in Asia only began to appear from 2003.
A majority of the research articles could be expected to come from China, Japan, Indonesia, Bangladesh and Pakistan due to the population size of the countries and their greater number of academic researchers. Figure 18 shows the distribution of articles on website usability in Asia across different Asian countries. Figure 18 illustrates that a majority (25%, 15 of 60 articles) 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% or 12 of 60) and Taiwan (18% or 11 of 60 articles). In contrast, little research on “website usability in Asia” has been conducted in Western Asia. To our surprise, there were not many articles retrieved from India, whereas many of articles were retrieved from China and Japan.
From previous research it could be expected that the use of theory would be limited, and that cultural theories would be perhaps the most frequently used frameworks for studies of website usability in Asia. This first of these propositions was true - the use of theory was scarce, if at all present, in many of the investigated articles. A little more than half of the articles (37 of 60, or 61%) mentioned any identifiable theory. Table 8 provides an overview of theories in relation to a particular topic. While looking into the theories related to culture, only some of the studies mentioned cultural theory for usability studies. Within cultural theories, Hofstede’s cultural dimension model was mostly adopted.

Table 8: Theories used in articles on website usability in Asia

<table>
<thead>
<tr>
<th>Theories</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>P34</td>
</tr>
<tr>
<td>Ant colony optimization</td>
<td>P60</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>P7, P19, P37, P44, P48</td>
</tr>
<tr>
<td>Cognitive Aging Theory</td>
<td>P13</td>
</tr>
<tr>
<td>Cognitive Theory</td>
<td>P22, P27, P47</td>
</tr>
<tr>
<td>Cultural Dimensions</td>
<td>P2, P8, P36, P56</td>
</tr>
<tr>
<td>Disconfirmation Theory</td>
<td>P22, P52</td>
</tr>
<tr>
<td>Empirical law</td>
<td>P35</td>
</tr>
<tr>
<td>Graph Theory</td>
<td>P31, P32</td>
</tr>
<tr>
<td>Information Desire</td>
<td>P17</td>
</tr>
<tr>
<td>Information Foraging Theory</td>
<td>P11</td>
</tr>
<tr>
<td>Information Learning</td>
<td>P6, P20, P23, P55, P4</td>
</tr>
<tr>
<td>Information Management</td>
<td>P5, P21</td>
</tr>
<tr>
<td>Mental workload</td>
<td>P16</td>
</tr>
<tr>
<td>Theory of Gestalt psychology</td>
<td>P3</td>
</tr>
<tr>
<td>Theory of Globalization</td>
<td>P10</td>
</tr>
<tr>
<td>Trust</td>
<td>P39</td>
</tr>
<tr>
<td>Visual</td>
<td>P15, P30, P33, P58</td>
</tr>
</tbody>
</table>
Another subset of the articles used website usability as the general framework of the study, without mentioning any specific theory. Table 9 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 9: Articles using website usability as a framework theory

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

Table 9 illustrates the articles used website usability as a general theory/framework of study and did not emphasize on one 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 the navigation burden, information retrieval and mining web structure, evaluation of website metrics for navigation, and general user interface navigation.

I expected that the commonly studied domains of websites would be university websites, religious websites, and government websites. This proposition turned out to be only partly true, as there was a great variety in the studied website domains. The domains of the websites included 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 domain were the most studied domains of the websites.

6.2 Study 1: UX study of an academic website in Pakistan

The first study was conducted between December 2009 and January 2010 in Lahore, Pakistan. A total of 17 participants were recruited for this first study. The first three participants were recruited for a pilot study while the data from a further 14 participants were used for main results of the study.
Table 10: Participants’ background information

<table>
<thead>
<tr>
<th>Background Information</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age</td>
<td>21 ($SD \pm 3.3$, low 19, high 23)</td>
</tr>
<tr>
<td>Gender distribution</td>
<td>7 Males, 7 Females</td>
</tr>
<tr>
<td>Average internet access</td>
<td>Every day</td>
</tr>
<tr>
<td>Weekly time spent on university website</td>
<td>12 minutes ($SD \pm 3$, low 0, high 32)</td>
</tr>
<tr>
<td>Years of study completed</td>
<td>15 years ($SD \pm 1.6$, low 13, high 17)</td>
</tr>
</tbody>
</table>

Table 10 shows the participants’ backgrounds. There were an equal number of male and female participants in the study. Participants were using internet on average once every day (10 of 14 participants). Some of the participants (3 of 14 participants) were using internet several times a day. Study participants did not spend much time on the university website in the week before study. Half of the participants spent five minutes or less on university websites during the week. Participants had completed and average of 15 years of education.

6.2.1 Activity 1: Scenario-based brainstorming through card sorting
All the participants of the scenario-based card sorting used their own approaches to organize information into categories. Initially there were three main factors that were prominent in participants’ organizations. The first factor in the organization of information about their university website was the use of language. Despite the fact that all participants spoke Urdu, Punjabi, or some other local language, all the participants used English when constructing the contents of the university website in the scenario-based brainstorming. The other important factor was the tone in the use of language. The participants’ use of lingo specific wording was prominent in the websites structure. The use of lingo specific wording was found across different participants. The categories such as “Extra Curricular Activities”, “Student behavior”, “Fee submitting dates”, “Complaints”, “Pick and drop service”, “installments” are some of the examples. A majority of participants were keen to see a university ranking or university status on the university website. It appeared that
university students wanted to see the status of the university as compared to other universities in the country.

*When we [students] go to some university, we first check what [the] university holds in ranking, it is an approach of students that we want to check on PEC [Pakistan Engineering Council] and HEC [Higher Education Commission] ranking that where [a] university [ranks] in relation to other universities in the country.* (Participant-12)

Table 11 provides an example of how participants structured information into first level categories and what participants wrote during the brainstorming activities. Three of fourteen participants categorized information into second level categories (i.e., Study  Bachelors  Exam dates). Most of the participants provided information up-to first level category.

<table>
<thead>
<tr>
<th>University Information  Course of study</th>
<th>Calendar  Holidays  Fee Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updates  Holidays  Events  Seminars</td>
<td>Communities  Islamic Society  War against Terrorism</td>
</tr>
<tr>
<td>Results  Old Results  New Results</td>
<td>About University  History  Achievements</td>
</tr>
<tr>
<td>Study  Bachelors  Exam dates</td>
<td></td>
</tr>
</tbody>
</table>

The third main factor in the scenario-based card sorting was the order of information. Not many participants provided a deep hierarchy of information. Only some participants (3 of 14) made sub-categories when creating contents in brainstorming activity.

**6.2.2 Activity 2: Open card sorting**

The average participant of the experiment placed 8 out of 50 cards into a category with the name ‘Other’ or ‘Miscellaneous’. The taxonomy of the cards and categories were directly taken from the university website of the participants, but a number of them did not know
about the category ‘Alumni’ and placed different cards in this category. The general agreement of cards in a single category was very low and participants’ categorization schemes changed enormously when comparing it with other participants of the study.

Table 12: Distance of participants’ sorts from one another

<table>
<thead>
<tr>
<th>Participants</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>24</td>
<td>27</td>
<td>29</td>
<td>28</td>
<td>31</td>
<td>33</td>
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<td>23</td>
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<td>25</td>
<td>28</td>
<td>23</td>
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<tr>
<td>10</td>
<td>30</td>
<td>26</td>
<td>32</td>
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<td>25</td>
<td>20</td>
<td>31</td>
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<td>30</td>
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<td>26</td>
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<tr>
<td>12</td>
<td>28</td>
<td>29</td>
<td>28</td>
<td>32</td>
<td>27</td>
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<td>25</td>
<td>26</td>
<td>21</td>
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<td>4</td>
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<td>5</td>
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</tr>
</tbody>
</table>

Table 12 shows the edit distance of all participants from one other. Edit distance is a measure that explains the similarity or difference between the sorts of two participants. The number in the table shows the minimum number of steps required to convert one participant’s sort into another’s, where one step comprises of moving one card from one group to another group. Participant sorting varied significantly, with the smallest distance being 20 steps between participants 2 and 11.

For each card I determined a majority of the participants who classified the card in the same way. If more than half of the participants (7 participants or more) agreed on the placement of a card in one category, it was taken to mean that the placement of the content on that card was highly agreed on between the participants. If less than half of the participants (6 participants or less) agreed on the placement of a card in single category, it was taken to mean that agreement on the content of the card between the participants was low. There was high agreement between participants for 19 cards. In other words, there was low agreement between the participants on the placement of the information in categories or participants tend to think differently within a group.

I compared the difference between participants’ sorts and the way this information was sorted on the actual university website. The distance between participants’ sorts and the
actual university website’s contents (actual sort) was quite high as well ($Distance = 26.1$). There were 26 moves taken to make participants’ sort similar to the contents as it was appearing on university website.

6.2.3 **Activity 3: Information retrieval**
Participants were provided a set of activities and were asked to find information on the university website. The information was placed in different levels of the website. A level was defined on the basis of minimum clicks required to reach the information.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Optimal Path (clicks)</th>
<th>Successful participants’ average goal completion time (seconds) ($M ± SD$)</th>
<th>Success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal A</td>
<td>1</td>
<td>55.9 ± 39.3 (13 of 14)</td>
<td>92.7%</td>
</tr>
<tr>
<td>Goal B</td>
<td>1</td>
<td>49.1 ± 38.5 (13 of 14)</td>
<td>92.7%</td>
</tr>
<tr>
<td>Goal C</td>
<td>2</td>
<td>72.7 ± 49.3 (12 of 14)</td>
<td>85.7%</td>
</tr>
<tr>
<td>Goal D</td>
<td>3</td>
<td>138.2 ± 30.7 (6 of 14)</td>
<td>42.7%</td>
</tr>
<tr>
<td>Goal E</td>
<td>3</td>
<td>75.1 ± 53.1 (9 of 14)</td>
<td>64.3%</td>
</tr>
</tbody>
</table>

Table 13 provides participants’ average time spent to find information and their success rate. The table indicates that participants spent more time on finding information placed deep in the hierarchy. Many of the participants could not find the information that was placed deep in the hierarchy of the website.

6.2.4 **Results from interviews in study 1**
During the interviews with participants, a number of issues related to website UX were discussed, such as purposes for visiting the university website and their opinions of the UX of the website. Table 14 provides a summary of participants’ feedback on the university website. Participants mentioned a number of reasons for using the website, such as accessing university e-mail, registration of courses, checking exam results, fee installments, calculating grade point average, and checking event pictures. Only a few of the participants expressed positive (+) views, while others provided neutral (0), or relatively negative (-) views towards the UX of the website.

<p>|                | Summary of participants’ interview and feedback for the university website | 91 |</p>
<table>
<thead>
<tr>
<th>Issue</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Email, registration, exam results, library, course schedules, fee installments, grade point calculations,</td>
</tr>
</tbody>
</table>
| Opinion of the UX of the university website | + Good and impressive  
0 Even-steven  
0 Nice but complicated  
0 Do not use much  
- Dull and not attractive |
| Design of university website           | + All-right,  
0 Normal  
- Absolutely poor and not colorful  
- Not special  
- Absolutely poor  
- Boring  
- Font is small |
| Appearance of university website       | 0 Normal  
- Should be appealing  
- Very blue and small font  
- Not creative and not innovative |
| Issues with website                    | - Complicated, appearance not good, not properly categorized  
- Not updated  
- Menu and subtitles are not standard, problem with navigation, confusing  
- Important information should be displayed with big text  
- Information is not updated  
- Information map is bad  
- Navigation problem |

Participants rated the website UX on a Likert scale, as shown in table 15. In participants’ view, information was not clearly presented on the website, and the website search was not useful for finding information.
Regarding the design and appearance of the website, participants stated that the design and appearance was boring and unappealing.

*Design is absolutely poor. It is not all that colorful and the font used is too small to see things clearly.*

(Participant 9)

Many of the participants expressed that they did not frequently use the university website because its information was not up to date.

*I use university’s website for my academic schedule, teacher’s contact numbers-mail id ...... I don’t use university’s website [because] it does not uploaded all the information on time and we can get the same information from other sources like friends and notice boards etc.* (Participant 7)

Local power structure and administration handling is an aspect that impacts on the design of information and how information is displayed on a university website.

*I think it’s the discretion of the designer that provided this and this information at that place. Frequent change of the management does not allow them to [update] this. When you enter the university you will come to know that deans are changed every day so one day if dean thinks that events should be updated on daily basis they are and if other thinks that they should be no editorial on the webpage there will be no editorial.*

(Participant 4)

<table>
<thead>
<tr>
<th>UX assessment</th>
<th>(1. Very poor ... 5. Very good)</th>
<th>(M ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of Use</td>
<td></td>
<td>2.4 ± 0.51</td>
</tr>
<tr>
<td>Attractiveness of design/appearance</td>
<td></td>
<td>2.4 ± 0.63</td>
</tr>
<tr>
<td>Ease of finding information services</td>
<td></td>
<td>2.5 ± 0.52</td>
</tr>
<tr>
<td>Information that was clear and easy to understand</td>
<td></td>
<td>2.1 ± 0.62</td>
</tr>
<tr>
<td>Accurate and up to date information</td>
<td></td>
<td>2.5 ± 0.65</td>
</tr>
<tr>
<td>Usefulness of site search</td>
<td></td>
<td>2.2 ± 0.58</td>
</tr>
</tbody>
</table>

Regarding the use of language, some of the participants agreed that information on websites should be displayed only in English, because it helps them to practice the language, which is important in the job market and for professional development. There
were some participants who mentioned how use of English language can also become a barrier to understanding the contents sometimes.

*Most of the university students are not equipped with English language because they belong to backward areas that is why web in Urdu will be much helpful for them. As when I was in graduation I don’t know the meaning of Alumnae it really makes a great difference to me also.*

(Participant 6)

*The thing is most of the students of the university have came from other rural areas and they find it difficult to find the information. This is a nice kind of idea if some information is provided in Urdu it will be good and helpful.*

(Participant 14)

The interview shows that participants of the websites were less satisfied with the UX of the website.

### 6.3 Study 2: UX study of an academic website in Denmark

The second study was conducted in August 2010 in Copenhagen, Denmark. The participants were provided similar activities as in the previous study, but a local university website was used to conduct the assessment. A total of 17 participants were recruited for this study, with the first three participants were participating in the pilot study and 14 participants joining the main study.

<table>
<thead>
<tr>
<th>Background Information</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age</td>
<td>23 (SD ± 1.3, low 21, high 25)</td>
</tr>
<tr>
<td>Gender distribution</td>
<td>7 Male, 7 Female</td>
</tr>
<tr>
<td>Average internet access</td>
<td>Several times per day</td>
</tr>
<tr>
<td>Weekly time spent on university website</td>
<td>113 minutes (SD ± 135, low 5, high 180)</td>
</tr>
<tr>
<td>Years of study completed</td>
<td>16 years (SD ± 1.9, low 13, high 17)</td>
</tr>
</tbody>
</table>

Table 16 provides participants’ backgrounds. There were an equal number of male and female participants in the study. Most of the participants used the internet several times a day (9 of 14 participants). Some of the participants (2 of 14 participants) used the internet once a day. Study participants spent considerable time on the university website in the
week before exam. Half of the participants spent an hour or more during the week on the university website.

6.3.1 Activity 1: Scenario-based Brainstorming through Card Sorting
After study 1, I decided to use English in study 2 and all following studies, for brainstorming through card sorting due to translation issues and a lack availability of experts for evaluation in Danish.

Table 17: Information classification in the brainstorming session

<table>
<thead>
<tr>
<th>An example of hierarchies provided by participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education  xx  Masters  xx  Courses  xx  Information  xx  BSc  xx  How to apply</td>
</tr>
<tr>
<td>Schedule</td>
</tr>
<tr>
<td>Education  xx  Bachelors  xx  Exam  xx  Marks</td>
</tr>
<tr>
<td>Study line  xx  Bachelors  xx  Admission Requirements</td>
</tr>
<tr>
<td>International students  xx  Exchange students  xx  Courses for exchange students</td>
</tr>
<tr>
<td>Library  xx  Account loans  xx  Reservation</td>
</tr>
<tr>
<td>Study  xx  Bachelors  xx  Exam dates  xx  Dates</td>
</tr>
<tr>
<td>Study  xx  Program  xx  Bachelors  xx  Courses</td>
</tr>
<tr>
<td>Education  xx  HA (it)  xx  Rules  xx  Time table</td>
</tr>
</tbody>
</table>

Table 17 provides an example of how participants organized information into deep hierarchies. Many of the participant of the scenario based card sorting sorted information in this way. Participants were provided the same amount of time (15 minutes) as those in study 1 to come up with concepts and categories for the university website. Half of the participants (7 of 14) provided information in deep hierarchies.

6.3.2 Activity 2: Open Card Sorting
The distance between participants’ sorts and the actual university website’s content organization (actual sort) was 22.4. That is, there were on average 22 moves needed to make users’ sorts similar to the content as it appeared on the university website. For each card, I determined majority of the participants who classified the card in the same way. If more than half of participants (7 participants or more) agreed on the placement of a card in one category, it was taken to mean that the placement of the content on that card was highly agreed between the user groups. If less than half of the participants (6 participants
or less) agreed on the placement of a card in single category, it was taken to mean that the agreement on the content of the card between the participants was low. There was high agreement between participants for 34 cards. In other words users tended to think differently, but that difference was smaller between the Danish participants in study 2 than the Pakistani participants in study 1.

Table 18: Steps taken to make sort (participant sort) look identical to the university website (actual sort)

<table>
<thead>
<tr>
<th>Participant</th>
<th>Distance from Actual sort</th>
<th>Neighborhood participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant id-1</td>
<td>21</td>
<td>Participant id-3</td>
</tr>
<tr>
<td>Participant id-2</td>
<td>23</td>
<td>Participant id-7</td>
</tr>
<tr>
<td>Participant id-3</td>
<td>21</td>
<td>Participant id-5, 10</td>
</tr>
<tr>
<td>Participant id-4</td>
<td>21</td>
<td>Participant id-6</td>
</tr>
<tr>
<td>Participant id-5</td>
<td>25</td>
<td>Participant id-12</td>
</tr>
<tr>
<td>Participant id-6</td>
<td>22</td>
<td>Participant id-7</td>
</tr>
<tr>
<td>Participant id-7</td>
<td>22</td>
<td>Participant id-6</td>
</tr>
<tr>
<td>Participant id-8</td>
<td>19</td>
<td>Participant id-7</td>
</tr>
<tr>
<td>Participant id-9</td>
<td>25</td>
<td>Participant id-7</td>
</tr>
<tr>
<td>Participant id-10</td>
<td>22</td>
<td>Participant id-3</td>
</tr>
<tr>
<td>Participant id-11</td>
<td>25</td>
<td>Participant id-14</td>
</tr>
<tr>
<td>Participant id-12</td>
<td>19</td>
<td>Participant id-1, 5</td>
</tr>
<tr>
<td>Participant id-13</td>
<td>25</td>
<td>Participant id-10</td>
</tr>
<tr>
<td>Participant id-14</td>
<td>24</td>
<td>Participant id-11</td>
</tr>
</tbody>
</table>

Average: (M): 22.42

Table 18 shows the minimum distance each participant had, in term of sorting contents, from the actual website content. It also shows also show which other participant was closest to the each participant in term of distance.

6.3.3 Activity 3: Information retrieval

Participants were provided a set of activities and asked to find information on the university website. Table 19 provides participants’ average time spent finding the information along with their success rate. The table indicates that even when information was placed deep in the hierarchy, participants’ average time to find it did not increase much. Only three participants could not find the information that was placed deep in the hierarchy of website (Goal D).
Table 19: Goal achievement times and success rate

<table>
<thead>
<tr>
<th>Goal</th>
<th>Optimal Path (clicks)</th>
<th>Successful participants’ average goal completion time (seconds) (M ± SD)</th>
<th>Success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal A</td>
<td>1</td>
<td>59.0 ± 44.4 (13 of 14)</td>
<td>92.7 %</td>
</tr>
<tr>
<td>Goal B</td>
<td>2</td>
<td>42.4 ± 29.5 (12 of 14)</td>
<td>85.7 %</td>
</tr>
<tr>
<td>Goal C</td>
<td>3</td>
<td>79.2 ± 40.7 (10 of 14)</td>
<td>71.4 %</td>
</tr>
<tr>
<td>Goal D</td>
<td>3</td>
<td>55.3 ± 36.4 (11 of 14)</td>
<td>78.4 %</td>
</tr>
</tbody>
</table>

6.3.4 Results from interviews in study 2

During the interviews with participants, a number of issues related to website UX were discussed, such as purposes for visiting the university website and their perception of the UX of the website. In participants’ view, information was quite clear and understandable on the website and they were generally satisfied with its UX. Table 20 provides an overview of participants’ UX assessment. From the table regarding the UX assessment of the website, it can be derived that the participants rated the usability of website as higher.

Table 20: Summary of participants feedback for university website

<table>
<thead>
<tr>
<th>UX assessment</th>
<th>(M ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of use</td>
<td>3.2 ± 1.12</td>
</tr>
<tr>
<td>Attractiveness of design/appearance</td>
<td>3.4 ± 1.28</td>
</tr>
<tr>
<td>Ease of finding information services</td>
<td>2.7 ± 1.14</td>
</tr>
<tr>
<td>Information that was clear and easy to understand</td>
<td>3.7 ± 1.14</td>
</tr>
<tr>
<td>Accurate and up to date information</td>
<td>3.4 ± 1.16</td>
</tr>
<tr>
<td>Usefulness of site search</td>
<td>3.4 ± 1.01</td>
</tr>
</tbody>
</table>

In the interviews, participants stated that the university website was very structured.

Before the university website was not that good but now it is very good. Now it is really structured and different levels and the categories are available at different level. I find the information quite easily.

(Participant id-1)
The participants in study 2 rated the website UX as higher. Participants of the study were satisfied with the usability of the website.

6.4 Study 3: UX study of an e-commerce website in Pakistan

6.4.1 Description of participants
A total of 30 participants, 17 female and 13 male, from the Institute of Business and Management at the University of Engineering and Technology in Lahore participated in the experiment, while the pilot study included 3 participants. Study 3 was conducted at a different university than study 1. The average age of participants was 20 years (SD ± 1.65). Most of the participants were in business studies (73.3%) and some were from science and education (26.7%). The participants in the study had studied for an average of 14 years (SD ± 1.04). All the participants (N=30) had had a computer in their homes for an average of 6.5 years (SD ± 3.01). Most of the participants (83%) had had internet access in their homes for an average of 3.5 years (SD ± 3.08).

The participants were asked to rate their proficiency in English, Urdu, and one local or other language. English and Urdu were chosen because both are official languages of Pakistan, with Urdu also being the national language of the country. Participants were asked to rate their language proficiency in reading, writing, and speaking. Half the participants also filled in language proficiency for a local or other language (11 for Punjabi, 1 for Arabic, 1 for Sindhi, 1 for Saraiki, and 1 for German).

Table 21 shows the language fluency of the study participants for English and Urdu. The rating of the language fluency is from 1 (not at all fluent) to 5 (native). Participants fluency in Urdu speaking was significantly higher than English, $t(58) = -7.08, p < 0.001$.

<table>
<thead>
<tr>
<th>N = 30</th>
<th>English</th>
<th>Urdu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading (M ± SD)</strong></td>
<td>3.07 ± 0.64</td>
<td>3.67 ± 0.99</td>
</tr>
<tr>
<td><strong>Writing (M ± SD)</strong></td>
<td>3.10 ± 0.61</td>
<td>3.30 ± 1.15</td>
</tr>
<tr>
<td><strong>Speaking (M ± SD)</strong></td>
<td>2.47 ± 0.73</td>
<td>3.93 ± 0.87</td>
</tr>
</tbody>
</table>

The participants of the study considered their speaking proficiency in Urdu to be better than that in English. When asked about their use of language for writing reports and

http://www.uet.edu.pk/
making presentations, all participants (100%) stated that they used English as their functional language for writing reports and making presentations, with only one participant also using Urdu in those situations.

### 6.4.2 The website studied
Symbios.pk is an online shopping site based in Pakistan that sells items such as laptops, PDAs, mobile phones, home appliances, and digital Qurans. An overview of the website was taken from Alexa,\(^2\) yielding traffic data, global rankings, and other information. The average load time for the website was slow at 2.788 seconds, with 83% of sites in the world loading more quickly. The audience demographic of the website showed that 94% of its visitors were from Pakistan. Estimated daily unique page views per user for the website were 5.8 pages and visiting users spent 5 minutes and 37 seconds on average on the website. From the website, a set of 41 cards that represented its content were extracted, as described above, and used in the card sorting activity.

### 6.4.3 Card sorting results
During the open card sorting activity, participants made on average 6.31 first level categories (\(SD \pm 2.80\)) and 1.59 (\(SD \pm 2.69\)) second level categories. Less than half of the participants (43%) made second level categories. Participants who did make second level categories, made an average 3.54 (\(SD \pm 3.07\)).

I used cluster analysis to analyze the open card sorting, using the website service Optimal Sort\(^2\) as a tool. I decided on a threshold of 60% agreement of items between participants, in keeping with recommendations by Katsanos et al. (2008a, b) and Hudson (2012). The number of items decreases when participants’ agreement increases. Katsanos et al. (2008a, b) used a similarity matrix correlation from two tools, Autocardsorter and Card sorting, and found a similarity of participants between 50% to 61% agreement. During the analysis, a single card was included in the group only if at least 60% of the participants had placed it in the same group in their individual sorts.

The dendrogram of participants’ classifications (figure 19) shows that participants agreed 60% or more on card placement for most of the cards (35 of 41, or 85%). The participants

\(^2\) www.alexa.com

\(^2\) http://www.optimalworkshop.com/optimalsort.htm
clustered items in three major groups, with an average of 7 cards in each (7.67 ± 4.7), and additional groups with only a few cards. The largest cluster shows participants agreeing on placing one third (13 of 41 cards, or 31%) of the cards in a single category with a theme of ‘kitchen’.

![Diagram of information structuring by Pakistani participants](image)

*Figure 19: The dendrogram of information structuring by Pakistani participants*

The participants provided different labels for this group, including “Kitchen Appliances” (participants 3, 4, 9, 10, 13, 14, 19, 22, 28, and 29), “Kitchen Electronic Appliances” (participants 1, and 27), “Kitchen equipment” (participants 8 and 23), “Kitchen products” (participants 16, 20, and 24), “Kitchen Accessories” (participants 17 and 30), “Kitchen” (participants 6, 7, 18, 21, and 25), and “Kitchen items” (participants 26, 29, and 30). The second largest category contained 6 items (13%) clustered together under the theme of ‘washroom’. The names used by participants such as “Wash Room” (participants 7, 12, 15, 18, and 22), "Wash Room Things" (participant 11), “Bath Room” (participant 25),
“Washroom appliance” (participants 9, 14, 15, and 26), and “washroom accessories” (participants 16, 17, and 30). The third main theme contained 4 items (10%) clustered together in a theme of ‘bedroom’. The participants used alternative naming conventions such as “Bed Room” (participants 4, 6, 8, 11, and 19), and “Bedroom Appliances” (participants 4 and 5). The rest of the cards (approximately 44%, or 18 cards out of 41) were either in small clusters with only two cards in each or not clustered. For these cards, there was no agreement across participants as to clustering the cards into similar groups.

6.4.4 Information retrieval results
I hypothesized that participants would take less time to find information located on the first level of the hierarchy of website, due to the smaller number of clicks required. Conversely, finding information would take more time if the information was on the second level of the hierarchy, as it would take more clicks to reach the information. Participants in the study were provided with four information retrieval activities and were given three minutes to find the information described in each goal.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Optimal Path (clicks)</th>
<th>Successful participants’ average goal completion time (M ± SD)</th>
<th>Success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal A</td>
<td>1</td>
<td>68.5 ± 49.9 (16 of 30)</td>
<td>53.3 %</td>
</tr>
<tr>
<td>Goal B</td>
<td>1</td>
<td>25.7 ± 36.4 (29 of 30)</td>
<td>96.7 %</td>
</tr>
<tr>
<td>Goal C</td>
<td>2</td>
<td>86.9 ± 49.7 (14 of 30)</td>
<td>53.3 %</td>
</tr>
<tr>
<td>Goal D</td>
<td>2</td>
<td>97.9 ± 43.0 (26 of 30)</td>
<td>86.7 %</td>
</tr>
</tbody>
</table>

Table 22 provides an overview of optimal path clicks to reach the requested information. It also provides successful participants’ goal completion times, success rates (the percentage of participants finding the goal with the given time), and the average goal completion times. For Goal A, even though only one optimal click was required to find the information, half of the participants could not find it in the required time of three minutes. One of the reasons participants gave for not finding the information was general usability issues with the website, notably that the information was not placed in the right category. Generally, participants took more time to find information that was placed deeper in the hierarchy.

6.4.5 Website use in local and English language
Participants in the study were asked about the accessibility and use of websites in their local or national language. Table 23 shows the amount of time participants spent on local language and English language websites.

Participants clearly spent more time on websites that provided information in English. When they were asked why they preferred to access websites in English, many of the participants stated that accessing information in English helped them to practice and train their English language proficiency (see section 6.4.1). In the interviews, participants also noted that they accessed more websites in English because there was simply more information available. Furthermore, the technical issues described below regarding information retrieval in local languages were another reason for participants using English websites for information.

<table>
<thead>
<tr>
<th></th>
<th>Local language websites</th>
<th>English language Websites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not Open it</td>
<td>(15) 50.0%</td>
<td>(1) 3.3%</td>
</tr>
<tr>
<td>Less than 1 minute</td>
<td>(8) 26.7%</td>
<td>(4) 13.3%</td>
</tr>
<tr>
<td>1-10 minutes</td>
<td>(7) 23.3%</td>
<td>(9) 30.0%</td>
</tr>
<tr>
<td>10-30 minutes or more</td>
<td>(0) 0%</td>
<td>(16) 53.3%</td>
</tr>
</tbody>
</table>

It was interesting to find that half of the participants (50%) never opened websites in a local language or in Urdu. A further quarter of the participants (26.7 %) only visited web pages in local or national languages such as Urdu for an average of less than one minute per visit. This is at least in part because local language websites had a number of problematic issues. When the participants were asked about the biggest general problem in their use of websites in their local language, most (53%) stated that they were unable to find information in the local language. Some of the participants (19%) stated that it took too long to view and download pages that are presented in local languages. One of the reasons they stated for this was that text on web pages in local languages (Urdu and Punjabi) was presented as image files, and hence was less readable.
Figure 20 provides the searchable text (left) and text as image file (right) as an example of the display of text generally practiced on local websites in Pakistan. The participants expressed that although websites display text as an image file, the font style of the searchable text (left) makes it difficult to read information. They further mentioned that the text in the image files could not be retrieved during their search queries, making it difficult to use the websites in the local language. Despite this, when participants were asked if an organization should ever present its website in local language, only 36% of the participants wanted to see this happen because of the respect it would show for their local culture. Some participants (30%) also wanted to see website contents in local languages because it would be useful for more people.

## 6.5 Study 4: UX study of an e-commerce website in Malaysia

### 6.5.1 Description of participants

A total of 38 participants (14 male and 24 female) from the University of Malaysia Sarawak participated in the experiment. The average age of participants was 24 years (SD ± 1.71). All of the participants were studying information technology at the bachelor or master’s level and had studied for more than 15 years (SD ± 1.46). Most of the participants (94%, or 36 of 38) had had a computer in their homes for an average of 8.6 years (SD ± 3.99), although two of the participants did not have a computer in their home at the time of the study. Most participants (76%, or 29 of 38) with a computer had had access to the internet in their homes for an average of 7.31 years (SD ± 3.67).
To ascertain language proficiency in different languages, all the participants filled out a language fluency questionnaire for English and Malaysian in reading, writing, and speaking. A total of 17 participants filled in the questionnaire for Chinese language proficiency, 4 participants claimed Tamil language proficiency, and one participant claimed fluency in Bidayuh. The language fluency rating of the language was again measured on a scale from 1 (not at all fluent) to 5 (native). For language fluency in English and Malay, the results of the study showed that students considered their language fluency in Malay to be significantly better than English in their reading, $t(37) = -4.01$, $p < 0.01$, writing $t(37) = -4.52$, $p < 0.01$, and speaking $t(37) = -5.12$, $p < 0.01$.

Table 24: Malaysian participants' language fluency in English, Malay, Chinese, and Tamil

<table>
<thead>
<tr>
<th>Language</th>
<th>Malay</th>
<th>Chinese</th>
<th>Tamil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading</strong></td>
<td>$N=38$</td>
<td>$N=38$</td>
<td>$N=15$</td>
</tr>
<tr>
<td>$M \pm SD$</td>
<td>3.39 ± 0.72</td>
<td>4.03 ± 0.85</td>
<td>4.40 ± 0.91</td>
</tr>
<tr>
<td><strong>Writing</strong></td>
<td>$M \pm SD$</td>
<td>3.08 ± 0.59</td>
<td>3.76 ± 0.88</td>
</tr>
<tr>
<td><strong>Speaking</strong></td>
<td>$M \pm SD$</td>
<td>3.03 ± 0.59</td>
<td>3.84 ± 0.85</td>
</tr>
</tbody>
</table>

I further compared the language fluency of Malaysians with Chinese ethnicity and Malaysians with Malay ethnicity, finding that Malaysian participants of Chinese ethnicity were better in reading, $t(15) = 2.44$, $p < 0.05$, in Chinese than Malaysian participants of Malay ethnicity were in the Malay language. However, there was not much difference in fluency of writing between the Chinese and Malay participants. This implies that despite living in the same geographical area, participants with Chinese ethnicity found it comfortable to access information in Chinese language.

6.5.2 The website in Malaysia

Lelong.com.my is a Malaysian e-commerce website started in 1998 and a pioneer of the e-auction sector in Malaysia. At the time of the writing of this article, approximately 75% of website’s visitors were in Malaysia. The estimated percentage of global internet users who visited the website was 0.0262%. The average load time for the website was slow (1.834 Seconds), with 64% of websites were loading more quickly. An estimated daily unique page views per user was 9.9 pages and users spent an average of 8 minutes and 35 seconds per
visit. A set of 38 cards representing the content of lelong.com.my were developed and used in card sorting.

### 6.5.3 Card sorting results
The results of the card sorting activity showed that participants sorted the cards into an average of 6.03 \( (SD \pm 2.40) \) first level categories and 4.76 second level categories. There was a great variance \( (SD \pm 5.24) \) in making second level categories. More than half of the participants (55.26%, or 21 of 38) made second level categories. Among those who made subcategories, an average of 7.33 subcategories \( (SD \pm 5.05) \) were produced.

As in study 3, I used a threshold of 60% agreement of items between participants. The analysis of cards using a dendrogram showed that participants agreed on card placement for most of the cards (89%, or 33 of 37). The level of agreement for grouping varied between the participants. For example, most of the participants (90%) agreed to place the two types of watches and clocks together, but the agreement to place all four items, *Metal alarm clock*, *White LED Clock*, *Golden Touchscreen watch*, and *Black Analog watch*, together was less than 60%. The participants clustered items into five main groups (accessories, stationary, entertainment, living room, and kitchen appliances), and two smaller groups (clocks and watches). Figure 21 shows how participants clustered the items into different groups. The main cluster shows that participants agreed to place one third of the total cards (32%, or 12 of 37) into a single category with sub-themes of communication, technology, and living room.

The participants clustered items into major groups with an average of 7 cards (6.0 ± 3.0). The biggest cluster shows that participants agree to place many cards (9 of 37 cards, or 24.32%) in a single theme. The participants provided different labels for this group, including “gadget”, “entertainment”, and “living room”. The same number of cards (9 of 37, or 24.32%) were placed in the theme of kitchen. The other theme of music and stationery had 3 cards (8%).

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6.5.4 Information retrieval results

The participants’ success rate in finding the required information was low and many of the participants were unable to find the information within the time limit of three minutes. The average success rate to find the information decreased when the information was placed deeper in the hierarchy. Table 25 shows the goal achievement time and the success rate of the participants of the study. It shows that in order to find information placed deep in the hierarchy, participants had to try more alternatives in the classification and thus spent time more time on the task.

Figure 21: The dendrogram of Malaysian participants’ website structures
Table 25: Information retrieval times and success rate

<table>
<thead>
<tr>
<th>Goal</th>
<th>Optimal Path clicks</th>
<th>Successful participants goal completion time</th>
<th>Success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal A</td>
<td>1</td>
<td>64.46 ± 46.04 (26 of 38)</td>
<td>68 %</td>
</tr>
<tr>
<td>Goal B</td>
<td>2</td>
<td>64.50 ± 47.49 (26 of 38)</td>
<td>68 %</td>
</tr>
<tr>
<td>Goal C</td>
<td>2</td>
<td>83.96 ± 41.99 (23 of 38)</td>
<td>61 %</td>
</tr>
<tr>
<td>Goal D</td>
<td>3</td>
<td>114.41 ± 53.68 (17 of 38)</td>
<td>45 %</td>
</tr>
</tbody>
</table>

6.5.5 Results of website use in local and English language

Malaysian participants were asked about the accessibility and use of websites in local languages as well as in English. Participants stated that they opened websites in both Malay and English. Participants stated they stayed on English language web pages for a longer period of time than on local language web pages. On local language websites, participants largely spent between 1 and 10 minutes whereas they would spend more than 10 minutes to browse for information on English language web pages.

Table 26: Browsing web pages in Malaysia

<table>
<thead>
<tr>
<th></th>
<th>Local language websites</th>
<th>English language websites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not Open it</td>
<td>2 (5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Less than 1 minute</td>
<td>6 (15%)</td>
<td>3 (7.9%)</td>
</tr>
<tr>
<td>1-10 minutes</td>
<td>17 (44.8%)</td>
<td>7 (18.4%)</td>
</tr>
<tr>
<td>10-30 minutes or more</td>
<td>13 (34%)</td>
<td>28 (73%)</td>
</tr>
</tbody>
</table>

Table 26 provides an overview of participants’ browsing of web pages in English versus in local languages. When the participants were asked about the biggest general problem in the use of websites in their local languages, most participants (55%) stated that they were unable to find information in their local language. Some of the participants further stated that it took too long (29%) and that links often did not work (29%).

6.6 Card sorting analysis

A critical reflection on the use of card sorting was conducted (Nawaz, 2012). During the investigation of issues in website UX, I used card sorting as a technique to investigate users’ cognitive style, which is shown through their information structure. Card sorting is a commonly used method in many UX studies when looking for users’ patterns of information structure. In the fourth paper, I looked into methodological and analysis issues related to the card sorting activity. I tried to understand how card sorting
revealed different aspects of information structure and agreement between participants. I looked into the analytical issues for card sorting that was used as one of the main methods in this research. I shed light on how the choice of card sorting analysis can affect the suggested information structure for websites. In the card sorting technique, a variety of analyses are used to interpret the resulting data, which can help the researcher and designers to understand users’ patterns of information structuring. These pattern show how users make sorting activities which reflects on their cognitive style, and thus can help to develop a user-centered website design. During analysis, the recurrence of patterns of classification between users influences the resulting website structure. However, the algorithm used in the analysis also influences the recurrent patterns found and thus has consequences for the resulting website design. I draw attention to the choice of card sorting techniques to understanding users cognitive style shown. The comparison of card sorting analysis shows how the choice of analysis can impact on the results of card sorting data. Based on the analysis, it appeared that there was more agreement between the users when analysis was conducted with the best merger method (BMM). However for the same data, the actual merger method (AMM) showed less agreement between the participants (Nawaz, 2012). This research focuses on how one can begin with the same data from a card sorting activity, yet arrive at different website structures. It further explains how the indicated agreement level between users can change for similar data depending on the choice of analysis.
7 Discussion

The following section discusses the findings of this dissertation. It relates the findings to existing theory and previously conducted studies in HCI. I would like to relate UX issues to cognitive style, context of use, and website information architecture.

The aim of this section is to put things into perspective. A number of issues have been studied and explored throughout this research. This section looks into different factors that have been studied and explored. The initial exploration and elevation of the topic brought us to the important issues I identified as being important to study. In the first phase of literature review, there appeared to be a need for cross-cultural research into websites and users. Most of the cross-cultural research focused on the surface levels of interfaces (Garrett, 2010; Juric et al., 2003; Sheppard & Scholtz, 1999; Sun, 2001). The initial literature was used to frame the problem at the outset of the research. Figure 1 outlined the important concepts and issues to be studied.

7.1 Exploring website UX in Asia

In the continuum of the first phase, it appeared that there was a need to look into regional research on website UX, as no such review had been performed previously. As the historical focus of HCI and UX studies has been in Europe and the United States, there is not much known about the history of HCI research in Asia, making it an important area to investigate. When framing research and its boundaries, there are different ways to deal with such issues. This research used a ‘from within’ approach to looking into website UX in the HCI research of Asia.

I explored propositions based on the literature and theory related to culture, HCI, and website UX. This provided a deep insight into the nature of HCI research in Asia and helped us to understand the development of HCI research on a national level and its level of maturity (Clemmensen, 2010; Smith et al., 2007). This led to the assumption that the number of publications on website UX in Asia would have increased over time, which was indeed the case over the investigated period of time. The reason for this increase in publications is due to the growth of the internet in the region, along with researchers
gaining insight into website UX in different domains. The SCImago Journal & Country Rank\textsuperscript{27} indicates that China, Japan, and India were the top research publishers in Asia between 1997-2006. The increase in website usability research in Asia can be related to the massive increase in number of websites in the late 1990s (Netcraft, 2012; Nielsen, 2006). The analysis of articles showed China and Japan dominating HCI research on website usability as expected, while India did not appear particularly high on the list of countries performing such research.

One aim of reviewing the literature is to determine which theories might be used to explore the research question (Creswell, 2009). I found the use of theory to be rather minimal in the articles surveyed. Theories of behavioral intention, learning, and mental workload were the most often used. Among theories of culture, Hofstede’s theory of national culture was the most popular. One reason for this is likely that Hofstede’s theory has clear handles that help researchers to clarify their research. IS researchers believe that global organizations need to understand cultural differences in the design of information technology. However the use of ’national culture’ may be overly simplistic as it glosses over the fact that ethnic and cultural groups can exist across many nations, just as cultural and ethnic differences can exist within nations (Myers & Tan, 2003). Myers and Tan (2003) argued that the concept of national culture is theoretically weak and ignores some of the facts of history. Thus, research methodologies should be improved to study culture and information systems.

Quantitative analyses were the predominant form of analysis used in the studies of website usability in Asia, another reason that Hofstede’s theory of culture was regarded as an appropriate model. An effective approach to website UX requires a mix of qualitative and quantitative methods. Quantitative website measures help to explain web analytics data and users’ satisfaction, whereas qualitative focused on group themes and subjective interpretations of users’ behaviors.

\textsuperscript{27} \url{http://www.scimagojr.com/index.php}. SCImago Journal & Country Rank is a portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.).
There were a number of studies (11%) that looked into the issue of cultural markers in different cultures. Some of the studies found significant differences in website UX 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, perception and animation, fonts, icons and images, and information design. 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. Most of the studies did not emphasize the analysis of icon, images, fonts, etc., despite these features being considered major points of interest in cultural markers theory. The research into surface level components of websites such as icons, images, and fonts is important for website design, but more focus should be given to information design on the bases of users’ cognitive styles and contexts of use.

Exploring the website UX of human-computer interaction is a process that occurs in evolutionary stages as described by Smith et al. (2007). The assessment of website UX at country level showed that research in the Asian region as a whole is rapidly developing and becoming an important factor in the design and development of products.

### 7.2 Website UX assessment across studies

I first compared website UX assessment scores provided by participants in all four studies. Participants were asked to assess the usability of websites on a scale from 1 to 5 (very bad to very good) in the first two studies. Six constructs were used to assess usability. These constructs were: ease of use, attractiveness of design, ease of finding information, clear and easy to understand information, accurate and up to date information, and usefulness of site search. The first four constructs were also used in studies 3 and 4. The data from the UX assessment of all four studies provided a global view of assessment of websites UX.

The collective average of UX rating of the university website in study 1 in Pakistan was 2.35 (SD\± 0.58) and the collective average of UX rating of the university website in study 2 in Denmark was 3.31 (SD\± 1.14). In studies 3 and 4, the collective average of UX rating for e-commerce websites was 2.83 (SD\± 0.69) and 3.11 (SD\± 0.86) consecutively. The users also provided further assessment of the websites in the interviews.
The general UX scores show that evaluation score for academic website and e-commerce website in Pakistan are generally low. The quantitative measure for UX assessment depicted a general idea of website UX. For example, the collective average of for study 1 is 2.35 (SD + 0.58), users’ attitudes and expression in the qualitative interviews for the website were also generally negative. On the other hand in study 2, the collective average score for study 2 was 3.31 (SD + 1.14), users’ general opinion in the qualitative interviews for the website were also positive.

I usually find the information that I need. The menu is very easy and there is quite few information in start. I have seen some websites where there are lot of Information in one menu that makes it difficult to use: (Participant 2, Study 2)

In summary, there were some UX issues with the websites across studies. There were general UX differences among the users within a group as well as across groups. The quantitative assessment of UX problems of websites provided some indication and reasoning for the difference in UX. The users’ feedback in the interviews provided a qualitative reasoning that website UX issues were dependent on the context of use.

### 7.3 Exploring users’ models of IA

All four empirical studies assessed users’ models of information structure through different techniques such as card sorting, information retrieval, and interviews. In website UX, a lack of appropriate website design (i.e., wireframes) can cause critical UX problems and degrade the overall interaction experience (Katsanos et al., 2008a, b). When new information becomes available on a website, this information is fitted into pre-existing structures alongside other information, or a new design must be created.

While analyzing the card sorting data, study 1 of the academic website in Pakistan showed that users made 6.7 first level categories, and in study 2 of the academic website in Denmark, users made 7.1 first level categories. However the difference between the Pakistani participants and Danish participants for users’ sorts in term of depth of information is not significant. The analyses of study 3 of e-commerce in Pakistan and study 4 of e-commerce in Malaysia showed that for information classification, participants in these two cases constructed the information in a similar way. Pakistani participants made 7.7 first level categories and Malaysia participants made 7.3 first level categories.
Pakistani participants made more first level categories because participants did not go deep in the hierarchy and made 3.54 categories on second level hierarchy. On the other hand, Malaysian participants made fewer first level categories, but made 7.3 sub-categories at second level of hierarchy. Compared to studies 1 and 2, which had fewer participants (14), the findings seem to indicate that Pakistani participants like to see information which are not provided deep in hierarchy in comparison do Danes and Malaysian participants. This difference could be aligned to Walton et al.’s (2002) view of the structure of pages. Walton et al. (2002) questioned whether the western hierarchical tree, as seen in traditional file structures, is suitable for South African users. The result indicates that there is more hierarchy of information classification in Denmark and in Malaysia compared to Pakistan.

The analysis of studies 1 and 2 showed that a majority of the Danish users agreed on the placement of 76% of the cards containing website contents, but that the majority of Pakistani users agreed on the placement of only 38% of the cards. One of the reasons for this lack of agreement among the Pakistani participants could be that there are different backgrounds of participants in a similar culture. In the interviews it was indicated that the majority of the users came to study at the university from different villages and thus had a more varied cultural background than was expected. Users’ cognitive style is shaped by shared knowledge, and influenced by the values, attitudes, and practices of the local ethnic groups they belong. This result is aligned with other researchers, who have argued such differences are present in the values, attitudes, communications, social practices, and cognitive styles of users (Nisbett, 2003; Plocher et al., 2012; Kayan et al., 2006). Although Nisbett (2003) divides our world into the East and the West, this study indicates that even within countries like Pakistan there is a great variance in the cognitive style of the users of websites.

### 7.4 Measuring information retrieval

Study 1 of a university website in Pakistan and study 2 of a university website in Denmark showed that the average time to successfully complete a task decreased with an increase in the depth of information (Nawaz & Clemmensen, 2011a, Nawaz & Clemmensen, 2011b). Overall, for all four studies, the studies partially confirmed the classic depth versus breadth trade-off (Norman, 1991; Yuviler-Gavish & Parush, 2008). For Pakistani users, the average
time increased quickly when information depth increased and the success rate correspondingly decreased. Answer depth in this example, figure 22, is the minimum number of clicks required to find the information on the website. A low answer depth means the information is accessible by fewer clicks (e.g. 1 click). Conversely, a high answer depth means that finding the information takes more clicks (e.g. 3 to 4 clicks). For Danish participants the average task completion time for tasks at low, medium, and high depth was 62 seconds (SD ± 56), 67 seconds (SD ± 53), and 82 seconds (SD ± 62). For Pakistani participants the average task completion time for tasks at low, medium, and high depth was 58 seconds (SD ± 39), 88 seconds (SD ± 59), and 134 seconds (SD ± 51), respectively.

![Graph](image1.png)

**Figure 22**: Relationship between task completion time and answer depth (studies 1 and 2).

In terms of task completion time, success rate, and information depth, there was some consistency. The context of use of the websites also had an impact on the results of the studies. Pakistani users in study 1 stated that they used the internet an average of once a day, whereas in Denmark participants were using internet several times a day. The university website use of the Pakistani users was also limited, with Pakistani users spending an average of 12 minutes on the website in a week. Whereas Danish users spent more than 100 minutes per week accessing university websites. Study 1 of a university website in Pakistan and study 2 of a university website in Denmark explained the relationship between task completion, answer depth, and success rate, providing an overview of Pakistani and Danish participants. It explained that response time and success rate are a function of information depth (Norman, 1991). For Danish participants of study 1, there was no relationship between increase in information depth and decrease in success.
For studies 3 and 4 of e-commerce websites in Pakistan and Malaysia, the time to find information increased with the increase of depth of information except in task A of study 4 in which half of the users were unable to find the information even though only one optimal click was required to find it. Malaysian users expressed that there were too many categories on the front page of the website and it was therefore not easy for users to find the information. The analysis of the websites showed that on average Malaysian e-commerce website had more selectable categories in a single page than the e-commerce website used in Pakistan. Malaysian e-commerce website had more than 20 selectable categories (20.66 ± 15.17) on a single page. The e-commerce website in Pakistan had more than 17 selectable categories on a single page (17.53 ± 18.15). In term of numbers of products, at the time of UX study the Malaysian website had approximately 378,718 products, while the Pakistani website had approximately 35,000 products. The selectable categories on the Malaysian or Pakistani websites, indicated in these two websites, may not be the general tendency for other websites in these countries.

These four comparisons describe that the process of information retrieval contains a complex mechanism involving users’ information retrieval activities. Partially, the process of information retrieval can be explained through general user interaction and UX rules such as response time and success rate being a function of information depth (Norman, 1991). In addition to the depth/breadth tradeoff, general UX issues with the website also added to the different success rates among the users of studies.

The studies in this dissertation have indicated that major issues regarding the UX can be addressed by assessing the general usability of the websites. Due to the user-centered nature of usability issues, cultural aspects of website usability can be treated as users’ requirements for information display. These requirements are changed and can be addressed by understanding users’ cognitive styles, which can be gathered through card sorting studies. The representation of user-centered information structures entails societal understanding of the information. These structures express the particular reflection of a society that is taken as the base of constructing information structure.

For websites’ IA, the studies in this research further indicated that there are some contents of websites that are regarded as central, while others are not central. For the central
contents of the websites, users tend to agree within the group about its place in the overall information structure, whereas for less central content users tend to disagree about their placement. Users’ shared knowledge plays an important role in framing their views in these cases of disagreement. Further, non-central contents tend to increase users’ navigational burden unless their placement is aligned with the users’ view, in accordance to the shared knowledge in their society. In term of users’ information retrieval behavior, I saw that users tended to take different paths to reach target information.

Figure 23, inspired by Hudson (2012), shows commonly taken incorrect and ideal paths towards target information.

![Figure 23: Overview of information retrieval](image)

Users do not use one strategy to find information. Some users acquire information through serial inspection, whereas others acquire information through random inspection. Nevertheless, the choice of users’ information retrieval approach takes input from their general understanding of the system and shared knowledge.

### 7.5 Context of use of websites

In this section, I address one of the many aspects of context of use, language. Understanding context of use can help to better illustrate users’ requirements and the impact of context on information. It helps to explain the UX of a system and to see if it fits well with users’ mental models or not. Context of use requires much attention in UX research. Shackel (1991) explains the paradigm of usability as a combination of users, tasks, and tools in an environment. For example, in study 1 the interviews with participants revealed their context of use in local culture. Website context of use required websites to be built not only in English, but to have some sections in a local language so that parents of students could view fee payments schedules and exam results in their local language as they often have difficulty reading and understanding English. The participants
easily related the context of use of websites in studies 1 and 2 with their personal experience because participants were using websites on a regular basis.

In study 3, the results showed that participants did not display any difference in their reading skills between English and Urdu. There was, however, a significant difference in their ability to speak English fluently relative to Urdu. In terms of the use of the websites in local languages, in study 3 in Pakistan half of the participants did not use any websites in their local language. Even though their language fluency in Urdu was as good as in English, participants did not use local language websites. The participants expressed that they looked for information in English generally because they were students and most of their studies were conducted in English. When I asked the participants about their preference for English language websites, they stated that there was more information available in English, and that they did not have problems with searching for information in English language, whereas local language (Urdu) websites had inferior search algorithms and text was displayed in the form of an image (section 6.4.5, figure 20).

In study 4 in Malaysia, the results showed that participants considered their language fluency in Malay to be significantly better than English when both reading and speaking. Only two participants (5%) stated that they did not open local language websites. This is a clear indication that participants in case study 3 (Pakistan) were more prone to use websites in English due to the issue with website use in local language as well as use of English language websites as a tool to practice English language skills.

Language related information was not collected in studies 1 and 2. However, assuming that Danish users are fluent in English and Danish, and they prefer to use websites in Danish. The results indicate that Pakistani users’ preference for using English language websites is different from Danish and Malay users for using local language. The choice of language preference is in line with users in Botswana who felt more comfortable speaking their own language in local situations, but when it came to computer use, preferred English (Sapienza, 2008).

Users’ cognitive styles and thinking processes relative to website structure are associated with their local environment. For example, in the first study in Pakistan, some participants
mentioned in the interview that they would like to see bi-lingual website structures in a single interface.

My parents are interested in knowing how I am doing in my studies... Both [of my parents] are literate but [they] cannot read English language. Currently website only provides my transcripts in English. They want access the section of webpage which contains my profile and transcripts. It would be such a relief if that section is provided in local [Urdu] language as I do not have issue in any language. (Participant 13 - study 1)

The association of local environment is also there in users’ choices of language for websites in Pakistan. The use of English is helpful in upward social mobility, leading users to argue that they use websites in English so that they can practice their language skills at the same time as finding information and browsing the internet.

[...] Perception of English and Urdu versions, we feel shy of our own language I also don’t want to tell anyone that I am good at Punjabi. I also didn’t write it in my resume this is because we want to speak English at organizational level and I need to practice that. (Participant 7 - study3)

Regarding information updates, one of the participants related it to the recent security threat and expressed that information was not updated.

It is quite confusing as you don’t get to know about the latest information and news about the university schedule, holidays. Just a day ago when there was a security threat and university was closed, no information was displayed on the webpage as to when would the university will resume again, students ultimately have to consult university office and to check notice boards about the latest information. (Participant 13 - study3)

7.6 Critical reflection on HCI research design in cross-cultural studies
There are a number of ways in which data can be collected in cross-cultural studies. A country-specific approach takes the country itself as a unit of analysis for data collection. Geert Hofstede’s (1984) cross-cultural theory takes national culture as its unit of analysis. In Hofstede’s views, taking a country specific approach often provides a common
geographical proximity, shared language, related historical background, similar religious beliefs and practices, common philosophical influences, and identical political systems in a country. Some of these things are not true, however, as some countries are enormous. Many countries have multiple languages and cultural groups may not share interpretations or experiences of history or religious beliefs.

Based on the experience of current study, a number of approaches are suggested for cross-cultural studies in diverse geographical locations. Following each of the approaches has its own merits and critical issues for conducting research. There are two main aspects of research design: activities to collect data and content used by users in the study. Table 27 suggests approaches for experimental design in HCI in cross-cultural studies. The contents describe the material that can be used for conducting cross-cultural studies. The material (information) can be taken from a website which is mainly accessed within a cultural group, or from a website which is accessed in different regions. The activities refer to the tasks (such as card sorting, information retrieval etc.) that are performed in HCI study. These activities can be localized or used across different groups.

<table>
<thead>
<tr>
<th><strong>Approach</strong></th>
<th><strong>Contents</strong></th>
<th><strong>Activities</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local research design</td>
<td>Local</td>
<td>Local</td>
</tr>
<tr>
<td>Comparative research</td>
<td>Universal</td>
<td>Local</td>
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<tr>
<td>Universal research</td>
<td>Universal</td>
<td>Universal</td>
</tr>
<tr>
<td>Comparative research</td>
<td>Local</td>
<td>Universal</td>
</tr>
</tbody>
</table>

*Local research design* helps to understand the issues within each cultural or ethnic group. In this approach, local contents are used and local activities are designed for each group. For example, the content may not be usable by users in another group, as they may contain information that is only important and valuable to the users of one specific group, culture, or ethnicity. However, this may make it problematic to validate the study, and will lead to challenges in comparing the studied group with another group.

In *comparative research design I*, the contents of the study are same across different cultural groups. The activities in comparative research design I are locally designed. These activities are designed by keeping in mind the requirements of each cultural group.
However, the same content is used across cultural groups in the experiments. For example, the content may be provided to one group in a metropolitan city who can understand them and can easily classify them into categories, while similar content is used in a rural area in which locals do not understand the descriptive language. The moderator then uses different ways (such as use of symbols) to make the content understandable for the local population. The similarity of content helps to compare studies across groups. However, a moderator may use different activities, which make sense to the local group. The approach of comparative research design I was not appropriate for this study because it uses the same content across groups. Using same content across different groups might miss aspects that are more important and relevant to the users of studied groups when local contents are provided. For example, for an academic website, the local contents might give a better understanding to the local users for grouping things into categories. The comparative research design I approach might provide good information about the contents validation through different activities, but it might not provide an explanation of why these issues appeared in different groups.

Most researchers use a universal research design approach to conducting HCI studies for cross-cultural research. In this approach, both the content and activities are universal. Since similar, but not same, contents are used with same activities across different cultural groups, this approach provides an easy and understandable way to conduct cross-cultural research. This is the case, for example, when the contents are taken from a universal website such as popular e-commerce website (e.g. eBay, IKEA, Amazon) and same contents are used across different locations for data collection. The same tasks are also given in this approach across different groups. This approach was not feasible for this research, because I wanted to use local content that would make sense to the users of a specific group.

In comparative research design II, local content is used in the experimental study, but same activities are designed across studied groups. This approach helps to understanding local issues of users' groups. Local contents are used in this approach, however the contents of the study are comparable with other studies. Thus contents of study are taken from a general domain and genre that can be compared with the contents used with other studied groups. This research used the comparative research design II approach for two key reasons. First, it helped to explain local content and issues related to the content from the
users’ point of view. Second, it was comparable with other studies because same activities were followed across the different studied groups.

### 7.7 Limitations

In this section, I present the limitations of all studies. I also discuss limitations that were faced during the process of data gathering, compiling, and analyzing.

#### 7.7.1 Limitations of studies 1 and 2

**Difficulty of in-group comparison**: The choice of having two groups of users with two websites, instead of two groups and a single website, in order to avoid bias for one of the two groups, did make it difficult to compare group results.

**Sample size trade-off**: The number of participants in study 1 were appropriate for card sorting to reach appropriation of 90% but not large enough for statistical analysis. On other hand, it is a trade-off because individual participants take up to 2 hours to go through the different phases. The study cannot only rely on survey questionnaire and needs the supporting material to combine with the survey.

**Literacy**: There is no clear measure of participants’ computer and internet literacy that supports our argument that the group were homogenous.

**Genre of website**: Only one genre of website was researched in this study. In the exploratory stage, there was not a clear typology of website genres. The selection of university website genre, may be too similar across countries, compared to other kinds of websites.

**Quality measure of website**: There was no independent measure of the quality of the website.

**Data material and analysis**: study 1 analyzed brainstorming data, instead of actual website content. The analysis of the study hinted that coherence and chances of higher inter-rater reliability could be achieved by conducting the same analysis on the contents of the website instead of brainstorm data.

#### 7.7.2 Limitations of studies 3 and 4
Limited usage of e-commerce website: In studies 3 and 4, I choose e-commerce websites for data collection. Most of the participants in studies 3 and 4 revealed that they did not use e-commerce websites, however, as most require a credit card, which they did not have access to.

Amount of products and information: The percentage of local traffic was the general measure used to pick the local websites. However, there was substantially more information and products available on the e-commerce website of study 4 in comparison to the e-commerce website of study 3. A better measure is required for future studies that not only looks into the traffic on the website but also looks into the quantity of information on the website as well.

7.7.3 General limitations
From an analysis perspective, it was rather challenging to analyze the data of the card based brainstorming because users’ ways of thinking about information and representing it on cards were not very structured. The attributes of information structure were only revealed through the depth and relationship of grouped items.

During these activities, asking users to find information via menu-based structures without using the search function had some disadvantages. For information retrieval, some of the users found it challenging to navigate through menus and links.

The use of edit-distance has some limitations in the analysis. Although the value of distance (d) is subjective to the researcher, the increase in number of categories results in more discrepancies between the groups. If users make many of categories (for example more than 10), it becomes difficult to interpret the results of card sorting, because there is a larger distance between the users

One of the limitations for the experiments was that participants might lack intrinsic motivation because their performance in the experiment had no real consequence for them. The usability study, as with other lab experiments, suffered from low validity because the experimental situations were artificial and participants might have behaved differently in the lab compared to how they would behave in everyday life. The number of participants in the experiments, for practical reasons, was low compared to the vast
number of people in the groups of which the participants were hypothesized to be representative.
8 Conclusion

When considering the UX of website structure, we must pay attention to users’ cognitive styles and contexts of use. Understanding users’ viewpoints, contexts of use, and cognitive styles is fundamental to user-centered design of local websites. This dissertation aimed to investigate users’ cognitive styles and contexts of use to improve the design of the information structures of websites.

The information structure of local websites should be aligned with local users’ cognitive styles for context of use of websites, and it should comply with local users’ images of website usability to improve UX. The overall conclusion must be that through this study we have gained a better understanding of relation between users’ cognitive styles and contexts of use, and the information structure of local websites, and how this can contribute to a better website structure, more aligned with users’ cognitive models. Through this study we are able to understand the nature of regional research in website UX.

8.1 Answering the research question

This research has answered the research questions in following ways.

RQ 1.1: Which issues related to websites and website domains are important in website UX research in Asia?

The first question was answered by exploring the issues related to website UX research in Asia. This revealed that website UX research in Asia is growing. I found that there are some genres and aspects of website UX which were studied frequently in Asia, but also that the use of cultural theories and frameworks for studying website UX was rather limited. The study revealed that not a single study used rural users as study participants, despite most of the population in Asian countries living in rural areas. Much of the research on website UX is conducted in the United States. While China and Japan are top research locations for website UX in Asia, they do not feature in the top five locations for website UX research globally. In contrast to the strong focus on only one kind of user, the finding of this study was that a broad variety of genres were studied, particularly academic websites, e-government websites, e-portfolios, library websites, and tourism websites.
The primary research question was thus answered on different levels. I emphasized the gap in the literature, explained how research into website UX is conducted in Asia, and pointed toward the proportion of website UX research according to country. UX research in Asia was compared with the general spread of research around the world and it has been argued that the focus of studies in Asia has been on different domains of interest, such as tourism websites UX, and different topics of study, such as the mental stress of users. In term of nature of research, the website UX research in Asia did not suffer from gaps, but instead emphasized different topics compared to website UX research in Europe.

RQ 1.2: How do local users’ cognitive styles relate to their context of use when using local websites?

The second question was answered by exploring how users’ cognitive style in terms of the classification of web content in Pakistan and Denmark related to context of use and information architecture. One part of this research looked into different classifications, such as thematic and taxonomic classification (Nawaz & Clemmensen, 2011a, Nawaz & Clemmensen, 2011b). There was an indication that the cognitive style of users in Pakistan is slightly different because, as their success rate decreased, their edit distance increased and there were lower numbers of second level categories. The analysis of taxonomic and thematic classification revealed that Pakistani users tended to use taxonomic classification more than the Danish users, classifying information into categories for which information items could mostly be related through higher levels of abstraction. In term of the resemblance of information structure of local websites with users’ information models in the studied groups, the two websites matched their users’ classifications to different extents. In the information retrieval tasks, the study found that Pakistan participants’ success rates decreased as the answer depth increased. There was no such relationship between information depth and success for Danish users.

The research found both differences and similarities between the Danish and Pakistani participants. The analysis of taxonomic and thematic classification reveals that Pakistani users provide more taxonomical classification than Danish users, herby cognitive style of Pakistani users differs concerning the structure of web contents than those of the Danish users. The difference in the percentage of taxonomic classification could be interpreted as
a cultural difference in cognitive sorting style. The Pakistani participants classified information into categories, for which information items can mostly be related through higher levels of abstraction. The Pakistani participants’ shallow classification might be explained by cultural background, literacy, and the website domain. The results also revealed that users in Pakistan were generally less satisfied with the usability of websites while Danish users were generally more satisfied with the usability of websites.

RQ 1.3: How do local users’ cognitive styles and contexts of use relate to the information architecture of local websites?

The third question was answered by looking into users’ cognitive styles through the activities of card sorting and information searching tasks. In the third question, I compared the case of Pakistan and Malaysia in terms of users’ information retrieval and users’ information structure within and across studies. While analyzing the study of Pakistan and Malaysia I found that the users had different approaches to acquiring information. Users tended to acquire information in a serial manner and to go into a website and look for information without skipping any part. The strategy of looking to acquire information through serial inspection brings the issue of serial or repeated failure, increasing users’ navigational burden. On the other hand, random inspection information retrieval with replacement provides users with cues about the webpages they had already visited (article 3). It also revealed that although participants language skills in Pakistan were similar in English and Urdu, participants clearly spent more time on websites that provided information in English.

RQ 1.4: How could different card sorting analyses influence the design of the information architecture of a website?

The fourth question has been answered by explaining how analysis can help or hinder the results of cross-cultural studies of website UX. I have explained how the choice of analysis technique for card sorting studies can impact the resulting information structure for a website. The study indicated that the information structure of a website should not only come from an analysis of card sorting, but should also be evaluated by subsequent usability testing. This fourth question regarding the analysis of card sorting also helps to build better websites. The choice of analysis for card sorting studies affects the suggested
information structure for websites. Therefore it is important to understand the analysis and its impact on the resulting structure. It helps to understand the choice of an appropriate approach to the analysis of card sorting studies. In summary, all questions and aspects of this research assist in building better websites for users.

8.2 Theoretical contribution

The main contribution of this dissertation is the argument that different website information structures, contexts of use, and cognitive styles matter. People’s ability to navigate is context dependent, and thus the information in the structures of websites should adhere to local users’ cognitive styles. In term of the localization of websites, different IAs matter because this research supports that idea that users of websites have a tendency to perceive websites in a context dependent way. A theoretical framework is suggested that can be used to study cross-cultural issues related to website UX.

Looking into users’ cognitive styles for information retrieval is something that can be studied further in the future. There are more studies required to confirm the results concerning thematic and taxonomic classification. Measuring users’ information retrieval through keeping different patterns in mind would be another way to move forward on the basis of this research.

In the comparison of card sorting analyses, much of the useful information regarding second level categorization of users was apprehended as part of first level categories in this research due to the limitations of tools that were used for data analysis. Finding a way to address this issue so that members of second and third level categories could also be incorporated into the analysis and assessed for recommendations would be valuable.

This research provided some ways to analyze studies that contain data of both qualitative and quantitative nature. For example, the study provided edit-distance as a method to evaluate if users cognitive style matches the content structure. Still more work is required to address the issue of data analysis for studies that include activities such as card sorting.

8.3 Practical Contribution

This research has contributed empirically to HCI research. First, it has shown how the combining different activities in UX studies confirms the results from different activities. It also emphasizes the importance of understanding the methodological issues surrounding
card sorting as a tool for analysis. Card sorting has great potential to help us understand users’ mental models. From a practical perspective, this dissertation has provided knowledge for UX practitioners who often use card sorting as one of their primary methods of collecting data. The study shows that users’ language background might not be the only reason for users’ choice of languages for website use. It has shown how the choice of the card sorting technique in UX studies has substantial implications for the results. It suggests that the choice of analysis for card sorting has consequences for website designs because the agreement level for different methods varies for the same data and different methods can thus suggest different structures of web content.

This research helps to understand website information from the user perspective. It addresses the issues of information structure regarding content centrality. It further addresses how some contents are central in websites while others go into different categories on the basis of users’ previous interactions with similar contents. The contents that are not central, these contexts are influenced through users’ backgrounds, which shape their cognition to view these contents.

This research helps to build better websites through understanding a number of issues. In terms of the literature, it helps to understand how website UX is being researched in Asia and what kinds of domains are being studied. The literature survey helps to understand the focus of website UX on different domains of websites. Thus, this research helps to build better websites through understanding the issues surrounding information architecture and information retrieval through user goals.
References


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Williams, R. (1985). *Keywords: A vocabulary of culture and society*: Oxford University Press, USA.


