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Culture and HCI: a review of recent cultural studies in HCI and social networks

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Abstract Studies on culture in HCI have always drawn the attention of academics. A comprehensive literature review of recent HCI studies on culture becomes a necessity. This study followed a systematic approach to review and create taxonomy of recent literature on culture from various HCI disciplines and how that relates to Social Networks. Most of the literature review focuses on recent studies on culture published in the last 5 years. The literature review reveals that understanding cultural values of people requires deep research. It highlights the complications of culture when it comes to interface design and makes some recommendations on designing more acceptable user interfaces. Understanding cultural values is essential for the design of successful and widely accepted user interfaces. The attempt of this study is to increase cultural awareness of people involved in international or cross-cultural HCI projects.

Keywords HCI · Culture · User interface · Social networks

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1 Introduction

The globalization of nations is becoming more and more apparent during the last decades. European Union is an example of how European countries unite together to form a kind of single entity. International companies, similarly, attempt to have a global presence. Some other companies prefer outsourcing their projects to developing countries to reduce costs and maximize profit. Communication in multicultural environments has therefore become a necessity. Culture, however, usually stands as an obstacle to communication if cultural characteristics are ignored. Language, beliefs, values, religion, history, political systems, and societal rules all together define the term culture.

The technological advancements of the World Wide Web have created new channels of communication. Many public and private organisations now have a web presence. Businesses have identified the new opportunities of doing business over the web. Advertising products or services on the web can reach millions of internet users and therefore potential buyers. As internet users are increasing across countries, companies will seek for consumers outside their national boundaries. Compared to the previous decades, computer or mobile device user interfaces have improved dramatically. The same applies for other web or software systems. User interfaces evolve over time and in line with technology advances.

The emergence of Social Networking Sites (SNS) has also created new communication channels. In recent years, the use of SNSs has increased exponentially. One of the most popular social networking websites is Facebook. It is at the top of the list of the most visited websites for almost every country of the world [65]. Facebook counts for 1.28 billion monthly active users at the end of March 2014 [24]. Other social networks count much less monthly active

users. Examples include QQ with 829 million active users, Google+ with 343 million users, Skype with 300 million users, Instagram with 300 million users and Twitter with 284 million users [64]. The large number of people using Facebook today has drawn the attention of academics to pursue research studies of user behaviour on Facebook.

The current state of literature in human computer interaction (HCI) and culture shows that culture in some cases stands as an obstacle towards the use of a system. The research community examines those cultural characteristics [49] that may partially be responsible for the slow uptake or rejection of a system. Cross-cultural studies, on the other hand, attempt to provide guidelines and methodologies [20] in designing systems widely accepted by users beyond country boundaries. Research shows that localization of user interface (UI) is essential to match the cultural characteristics of the target country [19]. At the same time, UI globalization is equally important for designing globally accepted user interfaces.

The main objective of this study is to document the current literature on HCI and culture. A review of these studies will lead to a better understanding of the major implications of culture in HCI. Additionally, the review identifies topics that are still unresolved or underexplored by the research community. The second objective of this study is to document studies on social networks and culture focusing primarily on Facebook due to its popularity [65]. Facebook is a widely accepted platform across regions. Facebook popularity therefore requires further investigation to identify the reasons behind this global success. This may help the research community to follow the Facebook paradigm in other systems. The study also attempts to increase cultural-awareness in the HCI community.

2 Methodology

The methodology followed to identify the literature on culture in HCI and social networks was by searching for articles in well-known relevant academic journals and through keyword searches in Google Scholar. Search for academic articles was initially performed at Google Scholar. Google Scholar is a *"freely accessible web search engine that indexes the full text of scholarly literature across an array of publishing formats and disciplines"* [71]. Search results in Google Scholar are not limited to a specific journal or conference. Search for academic papers can be customized by selecting a specific range of publication years.

The second step was to search for academic articles through keyword searches in the ACM digital library. The ACM digital library provides academic and scholarly journals, magazines, newsletters and conference

proceedings in computing. By following the citations of the papers found from the above methodology, it was observed that the journal of computer-mediated communication had relevant studies on culture in HCI. As a result, it was also chosen for inclusion for search of academic papers. The journal of computer-mediated communication covers the interdisciplinary field of computer-mediated communication. Following the same approach it was also observed that the International Conference on Usability and Internationalization also included related studies on culture. It was thus also selected for inclusion for search of academic papers. Additionally, by following citations of the above corpus, a number of other studies from various journals and conferences were also included.

Search keywords included "Culture", "HCI", "Cross-culture" "Hofstede", "Social Networks" and/or "Facebook". The selection of all papers found was primarily based on the title and abstract. A corpus of 120 papers was collected. After a more detailed review of the papers, 69 were selected for inclusion. These were judged by the authors as more relevant and in line with the scope of this research. The decision to exclude non-relevant papers was taken after carefully reading all important parts of these papers. These included the scope of the study, methodology followed and results. The papers excluded were not directly referring to the culture of people in HCI. Some papers, for instance, were examining social networks in general with only minor relevance to culture while some others were addressing culture in non-HCI systems.

The taxonomy of the papers, as shown in Table 1, revealed that studies of culture in HCI and SNS can be divided into two broad categories, described in the following.

2.1 Visible cultural attributes (hard attributes)

Attributes appear on the interface of an interactive system. These are frequently used to develop "culturally correct" user interfaces and attract users from a specific country or region. These interface components may appear on the user interface of websites, web applications, software or social network sites.

2.2 Invisible cultural attributes (soft attributes)

Attributes that influence user behaviour and perceptions towards the use of a system. These attributes may facilitate users to reject/accept, adapt slower/faster to the use of a certain system.

Most of the studies found indicate that users from different cultural backgrounds do not share the same beliefs and perceptions towards an HCI system. As technology is progressing rapidly it is essential to examine those cultural

Table 1 Taxonomy of papers found on culture per research focus

Research focus	Studies identified
Social networks	24
User interface (e-banking, e-learning, interface design, website design, government website design, mobile/smartphone interface, software development, information systems)	23
E-commerce (mobile commerce)	8
Computer-mediated communication (healthcare tools, e-mail, Wikipedia, web portals, web browser, educational technology	7
Usability	2
Virtual characters	1
Mobile services	1
Virtual spaces	1
Biometrics	1
Online social support	1
Total	69

effects that influence user behaviour towards the use of an HCI system. A comprehensive list of studies that examine culture in HCI per research focus is shown in Table 1.

The sections that follow begin with a summary of the literature on culture overall, including a description of Hofstede's cultural dimensions. The influence of culture in HCI is then discussed and divided into two sections: the *visible* and *invisible* cultural characteristics that influence users' perceptions towards the use of a system. The study ends with a discussion and conclusion section of the literature found.

3 Culture in HCI

Culture is a term for summarizing the way people think, feel or act in a society. Culture stands between the personality of an individual which is inherited and learned and human nature which is only inherited. It is very difficult though, to find the exact point that distinguishes culture from personality and human nature [39].

Cultural differences appear at four different levels of depth. These levels are symbols, heroes, rituals and values. Symbols, for instance, may be objects with a meaning for a certain culture. How someone is dressed, or their hair style also fall into this category. Heroes are persons who are either dead or alive and who form the behaviour of other people. These persons can be TV personalities or even cartoon heroes like Batman. Rituals are those excessive activities that are considered by a certain culture essential. Some examples of these actions are business or political party meetings, religious ceremonies or even daily

communication habits. Values are the core of culture. Values are those positive or negative feelings about a situation such as evil versus good, ugly versus beautiful, unnatural versus natural forbidden versus permitted, dangerous versus safe and others [39].

Culture according to Hofstede is a *"collective programming of the mind which distinguishes the members of one human group from another"* [38]. In his research, Hofstede identified five dimensions, which can be used to differentiate nations according to their cultures:

- *Power distance (PDI)* The level to which people accept inequalities among other members of the society.
- *Individualism versus collectivism (IDV)* The level to which people take care only of their own selves or feel as though they belong to a strong group and always try to protect it.
- *Masculinity versus Femininity (MAS)* Masculinity refers to societies with clear distinction between the two genders. Femininity refers to societies in which there is less differentiation between the two genders.
- *Uncertainty Avoidance (UAI)* The level to which people in different cultures feel vulnerable in risky situations.
- *Long-term versus short-term orientation (LTO)* In long-term orientation cultures, tradition is an impediment to change. In short-term orientation cultures, change occurs faster as these beliefs do not constitute an obstacle towards change.

Although Hofstede's theory on culture is of utmost importance, a number of studies criticize his research. Baskerville [4] criticizes Hofstede's theory in terms of associating nation with culture, the difficulties and limitations of attempting to quantify culture and the observer's status outside culture. Baskerville also expresses concerns about the validity of Hofstede's research today considering it as outdated. Other critics mention the lack of data from important regions of the world, such as the former Eastern block [59], while others believe that a sample from a company's employees is not representative of a nation's culture [32].

An example of how culture differs between countries is presented by Kongsompong et al. [44] who report cultural differences between Chinese, Thai and Indian. They [44] argue that social influence is stronger in collectivistic countries; people are less materialistic and more ethnocentric.

One of the areas that the research community focused on is the role of culture in HCI. Many studies were conducted to evaluate HCI to understand how cultural values influence user interaction. There are many studies that demonstrate the importance of culture in HCI. It is also generally accepted that the "one size fits all" approach does not exist in a user interface, mainly because of culture.

That is why some studies try to focus on ways to help web designers design with culture in mind [49, 68].

3.1 Visible cultural attributes

Visible cultural attributes, as has already been discussed, deal with those visual attributes that appear on a user interface. The most essential visible attributes are addressed in the following.

3.1.1 User interface

An aesthetically pleasing user interface is important as it will be the first impression of the user visiting an HCI system. All those visible attributes are important to positively influence users. Several studies attempt to find how a culturally sensitive user interface should be designed. Most of the studies identified try to propose some guidelines when designing for certain cultures. It is worth mentioning though that certain studies fail to predict users' preference even if cultural background was taken into consideration.

3.1.2 Visible cultural attributes in interface design

Many studies have associated Hofstede's cultural dimensions with user interfaces. Marcus and Gould [50], for instance, report that people in high uncertainty avoidance cultures must have few options to choose from so as to prevent users from getting lost. Additionally, instructions on how to use a web page are essential to prevent user error [50]. Haddad, McGrenere and Jacova [35] investigate cultural attitudes towards uncertainty between older Caucasians and East Asians. According to Hofstede's model, Western Caucasians are less uncertainty avoidant, while East Asians more uncertainty avoidant. The study uses two user interface designs to evaluate user behaviour, a rich one and a minimal one. The findings of the study show that East Asians are less anxious when interacting with the rich interface. The study also reports that more high uncertainty avoidant users notice the university logo on the interface than low uncertainty avoidant users. Low uncertainty avoidant users also notice that the user interface includes excessive information, compared to high uncertainty avoidant users [35]. In another study, Callahan [7] examines the differences between a number of university websites using Hofstede's cultural dimensions. The study shows that website interfaces of high uncertainty avoidance countries have more student pictures and more drawings than photos in contrast to low uncertainty avoidance countries. Additionally, it is argued that more images of women and fewer symmetrical pages are included in the design of websites in individualistic societies in contrast to those in collectivistic societies.

3.1.3 Visible cultural attributes in website design

The study of Kim and Kuljis [43] compares the website design of charity websites between South Korea and the UK. They demonstrate that South Korean websites include more multimedia and user input functionality to their websites than those in the UK. The authors observe that this is possibly due to the collectivistic nature of South Korea and the importance given to groups in decision-making. On the other hand, in individualistic nations such as the UK, an individual's opinion is equally important in decision making. Details about donors as well as the use of donation are also appearing more frequently in South Korean websites than in UK websites. This is possibly due the high uncertainty avoidance levels of South Koreans, which results in the necessity of having a clear view about donation use and who the donors are [43].

3.1.4 Visible cultural attributes in governmental website design

Navigation structure and the number of images or textual components used on a web interface often differ. A comparison of governmental websites between China and Brazil, Russia, USA, and India shows a number of differences as Goyal et al. [31] report. According to this study, governmental websites in China use more images than those in the USA. It is argued that high context cultures, such as China, tend to prefer non-textual components in contrast to low context cultures as the USA. This rule, however, does not apply for Brazil, Russia and India which are also high context cultures. The study highlights differences in the navigation structure between Chinese and US websites. Navigational structure, though, is not a representative sample of the culture of these two countries. More specifically, Chinese navigation structure is more complicated than the US one. As a result, it does not reflect the high uncertainty avoidant culture of China [31].

3.1.5 Visible cultural attributes in web browsers

Some other studies demonstrate how a user interface is more appropriate for each country. Shen et al. [60] indicate how a Chinese web browser should be designed. Chinese prefer icons with text over icons only in a browser's interface. The study states that Chinese prefer a web browser that gives them the feeling of a computer game. That is why the development of a 3D interface for the Chinese web browser is proposed [60]. Kang and Corbitt [41] report that Australian web developers do not consider logos as important as Singaporean developers. Australian developers believe that the reputation of a company is more significant than a single logo picture. Barber and Barde [3]

indicate that Brazilians prefer to use many colours in their websites instead of one dominant colour. On the other hand, Lebanese prefer less graphical elements and a more text oriented user interface.

3.1.6 Visible cultural attributes in e-banking

French et al. [26] examine a number of web site interfaces in China, Zanzibar and Taiwan. Their study shows how the design of various web interfaces reflects their local culture. Some interface components taken into consideration are language, colour, navigation model, branding trust issues, aesthetic design and appeal. The study encourages heuristic evaluation in relation to the use of card-sorting techniques to identify local trust attributes in interface design. It is worth mentioning that this study also reveals that some web site interface designs do not match to the local culture. For instance, the Brazilian interface design version of both Deutsche and HSBC banks do not match to the cultural characteristics of Brazil—a collectivistic country.

3.1.7 Usability

Users seem to prefer designs that consider the elements of their culture. People with Kuwaiti, Egyptian or UK nationality prefer a design that respects their cultural characteristics [1]. The question whether a culturally adapted design could also lead to better usability results is partially confirmed as only users of Kuwaiti nationality confirm this. People from Egypt prefer the Kuwaiti cultural design, while UK people find both Egyptian and UK designs almost equally usable [1]. In their study, Duncker et al. [21] review cross-cultural interface design solutions and highlight the diversity of components that need to be considered when designing for local cultures. Some of these components are cultural markers, language and signs or symbols. The most important difficulty when designing local systems is how this enormous information about culture can be organized for designers of interactive systems [21].

3.1.8 Localization issues

Witte [73] shows the importance of localizing software applications. This study examines a medical software application and shows that incorrect localization leads to usability problems. This study examines the following issues that need to be considered during the localization:

- *Context* Context is important so that language translation of software is accurate. For instance, back may be translated as back to previous page or the back of the human body.

- *Grammar* Grammar varies between different languages. An automated "one-size-fits-all" translation system is therefore more likely to fail in providing accurate translation.
- *Numbers* Although in countries such as England or Germany the numbering system is similar in some other countries this differs. For instance, the number range "6 out of 50" in England or Germany, is represented in Japan as "50の6". The number ordering therefore changes according to the language used.
- *Sort order* The sort ordering system varies between countries. For instance, Japanese sort with stroke-count, while the Spanish use two different methods for sorting, a modern and an older one. In China, on the other hand, sorting by pronunciation is preferred.
- *Names* Names in Japan may be written in three different systems. It is important therefore that all name representations appear accurately. This is critical especially in medical software.
- *Calendars* The Gregorian calendar, although popular, is not the only one used worldwide. Emperor calendar is used in official document communication. As an example of this difference "November, 29th 1966" is represented by 「昭和41年11月29日」.

Chakraborty et al. [9] examine cultural characteristics of Zambian people by presenting a set of images and symbols to them. The study demonstrates that Zambian people show a greater understanding of user interface features that are familiar to them. The study mentions, however, that although Zambians are not familiar with non-USA date and time formats, they also show understanding of other date formats. The authors believe that this may be due to the use of the internet by Zambian people. Users have the opportunity to get to know unfamiliar cultural characteristics to them [9].

Windl and Heimgärtner [72] highlight the necessity to include cultural aspects during the design process of a user interface. These authors try to "integrate culture" into the models of usage-centred design proposed by Constantine and Lockwood [12]. These abstract models consist of role, task, content and implementation models. When taking into consideration culture in role and task models, it then affects the result of content and implementation models. As an example this study [72] indicates that for a kitchen inventory control system, an additional role is required in Israel in contrast to European countries. This is due to the need of maintaining a user role to control how the food is prepared according to Jewish Dietary Laws [72].

Although common software platforms are widely used today, cultural implications in UI still exist. The main differences in user interface of common software platforms between China and Czech Republic relate to layout and

colour. The study proposes guidelines for designing culturally specific user interfaces for China [6]. Liu and Keung [48] propose a cross-culture design framework for web designers. This framework is a result of previous research on culture. It takes into consideration Hofstede's five dimensions on culture in relation to three broad categories: function, interaction and surface.

3.1.9 Visible cultural attributes in mobile devices

Portable devices such as MP3 players today use an interactive user interface. As a result, cross-cultural considerations during the design of user interface are essential. Chen and Tsai [10] show that icons on mobile devices differ between Chinese and Asians. Glassware icons are used for the Chinese culture to demonstrate the quality of the user interface in contrast to more complex images found in daily life of the Asian people [10].

3.1.10 Visible cultural attributes in GPS

Navigation systems may not be suitable for all countries across the world. For instance, in Japan, street numbers do not follow an ascending order as in European countries. The street numbering system is based on the house build date. Search for an address is performed by using the telephone number and an algorithm returns the results for the house address. In Asia, car symbols on car navigation systems can be represented by one of a dozen car icons. In Germany, this is usually just an arrow that represents the driver's car [5].

3.1.11 Visible cultural attributes in electronic commerce

Kang and Qian [40] examine the web characteristics of a number of tourism e-commerce sites. They identify differences in web design characteristics between Australia and China. Chinese websites include more textual information and links than Australian. China as a collectivist (Hofstede [30]) country includes many interface components, such as friends' recommendations and feedback from friends [40].

3.2 Invisible cultural attributes

Invisible cultural characteristics, as already discussed, deal with those hidden cultural attributes that affect user's behaviour. The most essential invisible cultural attributes are addressed in the following.

3.2.1 User interface & Hofstede's cultural dimensions

Marcus and Gould [50] demonstrate how culture affects web design according to Hofstede's cultural dimensions.

They report that in individualistic societies people give more importance to youth in contrast to collectivistic societies where people tend to trust the experience of the older. In individualistic societies innovation is more important than tradition, while in collectivistic societies people are more willing to follow the tradition.

Han's study [36] examines the differences between Chinese and American users when searching for a word in a three column form. The words are listed in alphanumeric form, in one case are sorted by column and in the second case are sorted by row. The study shows that American users search faster when the list is in vertical order. On the other hand, Chinese users perform the same in both lists. The study argues that this may be due to the fact that Chinese from Taiwan and Hong Kong learned to read printed material vertically [36].

3.2.2 Invisible cultural attributes in e-mail

Tang et al. [63] show differences in email usage between European, Asian, Latin American countries and the USA. The study shows that US employees tend to keep a larger number of e-mails in their inbox compared to India, South Africa or other Latin American countries. Czech and Indian employees create considerably smaller number of folders for email filing compared to other countries. It is also shown that employees in European countries tend to index most of their emails into folders, compared to employees in Asian countries. The study underlines the fact that there is no relation between Hofstede's uncertainty avoidance dimension (UAI) and email filing into folders. The initial hypothesis that users in high uncertainty avoidance cultures would prefer email filing into folders is not confirmed. The findings show no association of the UAI dimension and email filing. The authors make some future recommendations for the design of email clients' interfaces. They suggest paying more attention to design more usable and user friendly interfaces for indexing files into folders for countries that use file indexing more. At the same time, it proposes a better search functionality for countries that prefer keeping their emails into their inbox [63].

3.2.3 Invisible cultural attributes in information systems

Hertzum et al. [37] raise an important question—whether users from different countries perceive information systems in a similar way. The study reports that Chinese associate a fun system with e-mail, while Danish with an easy-to-use system and Indians with useful systems.

3.2.4 Invisible cultural attributes in electronic commerce

Previous research has shown that cultural values may affect user behaviour towards the adoption of electronic

commerce. A study by De Angeli and Kyriakoullis [15] shows that culture may be partially responsible for the slow adoption of electronic commerce in Cyprus. High uncertainty avoidance cultures in line with the collectivistic nature of the Greek culture form an obstacle for the adoption [15].

Su and Adams [62] show the differences between two e-commerce websites: dangdang.com and amazon.co.uk. Dangdang.com was founded by a Chinese couple and targets the Chinese population. Amazon.co.uk (UK focus) is one of amazon.com international sites. The study highlights the difficulties of applying the amazon.com business model to China. The most important part of this study is that although China follows collectivistic culture individualistic characteristics do exist. The same rule applies for the British: although living in an individualistic society, collectivistic characteristics exist. For instance, the Chinese sample shows individualistic attributes in their decision to purchase as they would not consult their family or friends. The British sample reveals the opposite attribute—that they would consult their close family before purchasing. The study also shows that in collectivistic culture, purchase decision is taken more carefully in contrast to individualistic societies [62].

Lai et al. [45] compare the influence of culture in consumer content reviews between Chinese and American. The study focuses on analysing customer reviews of three electronic products from amazon.com, which targets the US market, and amazon.cn, which targets the Chinese market. The study demonstrates that Americans provide more feedback and recommendations on products compared to Chinese. The study also underlines that reviews differ between the two countries and focus on different aspects of the products [45].

3.2.5 Invisible cultural attributes in m-commerce

Dai and Palvia [14] identify differences in attitudes towards the use of m-commerce between China and the USA. As this study reports [14], product cost and social influence significantly influence the Chinese in their intention to use m-commerce. For Americans, privacy perceptions, usefulness, innovativeness, compatibility and enjoyment are factors that directly influence their intention to use m-commerce. Chinese, as a more collectivistic society consider social influence as an important factor to use m-commerce. At the same time, Chinese with higher uncertainty avoidance levels avoid using an innovative, new and unknown to them method of purchasing. On the other hand, Americans as more individualistic people tend to prefer innovation and enjoyment of the application to fulfil their personal needs [14].

3.2.6 Invisible cultural attributes in health care

One study of Chakraborty [8] highlights the importance of culture in healthcare tools. Healthcare tools are important as they provide more precise diagnosis to health problems and more effective treatments. Culture, however, may stand as an obstacle to the successful use of healthcare tools. For instance, the questions asked to patients for data input into the system, may be perceived as unpleasant and not provided. As a consequence, inaccurate data may lead to wrong diagnosis and treatment. In some individualistic cultures, for instance, medical information is considered highly sensitive and is not easily shared with others. In addition to this, interface design without considering cultural factors may lead to confusion. This happens when the product delivered to the end user is developed in another country [8].

3.2.7 Invisible cultural attributes in wiki communities

Pfeil et al. [54] show the importance of Hofstede's cultural dimensions in user behaviour in wiki communities. As their study reports, it is easier for people who come from low power distance cultures to delete content of other people in wiki communities compared to those in high power distance.

3.2.8 Invisible cultural attributes in web portals

Li et al. [47] report the effects of culture in technology acceptance of a personal web portal. The study examines cultural differences between China and the USA. The findings of this study show that users coming from individualistic cultures find a web portal easier to use than users from collectivistic ones. With regard to long- and short-term orientation, the study [reports that long-term-oriented users find web portals easier to use and at the same time more useful than short-term-oriented users. Long-term-oriented users acknowledge the benefits they will have once they learn how to use the technology. Any concerns of difficulties in learning the new technology are overcome as they are confident that their performance and productivity will be increased in the future. Short-term users, on the other hand, are inhibited by the difficulties of learning a new technology and do not see the future benefit from it [47].

3.2.9 Invisible cultural attributes in biometrics

Riley et al. [57] examine the acceptance of biometric technology in India, South Africa and the UK. The study shows that Indians are more willing to accept this biometric technology, while the British are less likely. Although the

study finds cultural differences, the results cannot be explained according to Hofstede's cultural dimensions. This may be due to the fact that biometric technology may differ from the rest of the technologies [57] or it may be due to the fact that people are not familiar with biometric technology.

3.2.10 Invisible cultural attributes in ICT adoption

Focusing on individualism and uncertainty avoidance, Erumban and De Jong [23] show the impact of culture in ICT adoption. Their study [23] examines ICT adoption across 42 countries and shows that nations with high individualism and low uncertainty avoidance rates score high in ICT adoption. On the opposite side, nations with low individualism and high uncertainty avoidance rates score low in ICT adoption.

3.2.11 Invisible cultural attributes in educational technology

Weinberger and Nistor [70] show the influence of culture towards the use of educational technology. The study uses Hofstede's cultural dimensions to examine differences in attitudes towards educational technology between Germans and Romanians. The study reports changes in cultural dimension scores compared to Hofstede's findings. For instance, Hofstede reports an overall higher uncertainty avoidance level in Romania compared to Germany. The findings of this study [70], though, show the opposite. The study reports that culture changes may be due to the influence of western European culture. It is interesting to note that Romanians are more positive towards the use of educational technology and at the same time have higher levels of technology anxiety compared to Germans. As the authors of the study explain, the positive attitude of Romanians towards technology may be due to the late technology adoption in their country [70]. Surprisingly, although the study reports lower uncertainty avoidance levels for Romanians compared to Germans, Romanians have higher technology anxiety. As expected, people with technical background are less anxious and more positive towards technology [70].

3.2.12 Invisible cultural attributes in communication

An interesting study by Wang et al. [69] examines the role of technology as a communication medium between American and Chinese participants. The study shows that Americans, mainly of individualistic culture, talk more than their Chinese counterparts, of collectivistic culture. Chinese talk more in a text only chat room compared to video chat communication. On the other hand, Americans

talk more in a video-enabled brainstorming discussion. In general, Chinese are less talkative than Americans. In same-culture groups, Chinese are less responsive compared to Americans. Contrary, in mixed-culture groups Chinese increase the responsiveness level close to the level of Americans. This study is important mainly because it highlights the importance of technology as a communication medium and how it affects the communication style of people across regions [69].

Another example worth mentioning is that for Koreans time to market is important in business. It is important mainly because time is critical for the success of a product. Therefore, they prefer to release a product on time, sacrificing the quality of a product. That means functional problems of products might be tolerated which contradicts to German's culture [5].

3.2.13 Invisible cultural attributes in software development projects

Ressin et al. [56] examine the influence of culture in software development projects in India. They highlight some characteristics of the Indian culture to consider, which include the following points:

- Quality criteria are not clear in the organization but each team member of the project gives his/her own meaning to how quality can be achieved.
- Qualification does not necessarily equal to professional diplomas obtained by following university studies. It is obtained based on personal desire and determination.
- Work processes are not written in a piece of paper and strictly followed by team members. Team members find their own role and follow their work processes according to the experience gained over time.

The study proposes some guidelines to follow when software is developed in countries like India. For instance, at the start of the project there must be a clear definition of what software quality means from the clients viewpoint. In addition to this, all software development processes must first be clarified and then followed [56].

3.2.14 Social networks

One key new technology application is online Social Networks. Social Networks play an important role today for both businesses and people. Businesses use social networks for advertising and promoting their products and services. People use social networks for fun or for connecting with friends. The large number of people engaged with social networks today makes them valuable for research studies.

The number of friends in social network sites is depending on the age group of their users. Arjan et al. [2]

examine age differences of people using MySpace. They show that teenagers have more friends in contrast to older people. The study also shows that women are more expressive than men irrespective of their age group. People in older age groups have fewer friends than those in younger ages. It is also worth mentioning that the study demonstrates that younger people have friends close to their own age group in contrast to older people having friends from diverse age groups.

Privacy and trust are important factors that influence users in their decision to use a system. Dwyer et al. [22] examine the differences in privacy perceptions between users of MySpace and Facebook. They show that users in both online social networking sites have neutral concerns about privacy. Although the findings of the study show no significant differences at trust level between the users of the two social networks, users tend to trust Facebook more. The results of the question whether "I trust that SNS will not use my personal information for any other purpose" indicate a higher mean score of Facebook (4.971) over MySpace (4.396) on a seven item scale. The results also show a neutral perception towards privacy in social networks. It should be noted that the study underlines the difficulty to understand the role of trust and privacy. It indicates that although MySpace scores less in users' trust level it is used more than Facebook to create new online connections. Similarly, although the study indicates concerns of users about privacy, this did not prevent users from sharing information [22]. It is believed that the perceived benefits of SNS outweigh the risk of users' personal privacy [11, 18, 51].

3.2.15 Invisible cultural attributes in social networks

The cultural background of people as in other web systems can also be observed in SNS. Literature review shows that people with different cultural backgrounds behave differently in SNS. The following list a number of studies of culture in SNS.

Zhao and Jiang [75] demonstrate that American users use more group photos as their profile photo in social network sites, in contrast to the Chinese. The result of this study contradicts the authors' initial prediction that Chinese users would use a group photo due to the collectivistic nature of their culture. Similarly, Peters et al. [52] show that Chinese prefer "good" images of themselves in contrast to Americans who prefer a group photo as their profile picture on Facebook. Zhao and Jiang [75] also demonstrate that Chinese tend to customize their profile photo, while Americans do not.

Zhao et al. in their study [74] emphasize that in general people disclose more to close friends and relatives. Americans disclose more in face-to-face communication compared to online communities. Chinese, on the other hand, disclose about the same level in both communication methods. Both Chinese and American users do not share more in online communities compared to face-to-face communication. They worry because of their inability to control who is allowed to view their personal data, in contrast to face-to-face communication. Chinese participants disclose more personal information to a coworker whom they consider as a friend in contrast to coworkers without friendship ties. Chinese see coworkers (without any friendship ties) as strangers as they disclose about the same level of information. On the other hand, US participants disclose significantly more to coworkers without friendship ties than Chinese participants [74].

Gao et al. [27] identify the differences of organizations when selecting collaborators through the use of social network sites. The study reports that Chinese organizations tend to choose a collaborator if shared connections exist and if the potential collaborator is also connected with people in important positions. On the other side, US organizations tend to favour a potential collaborator when he/she is expert in the desired field, regardless of the existence of shared connections.

3.2.16 Invisible cultural attributes in virtual spaces

Many studies have shown cultural differences of user behaviour when interacting with social networks. De Angeli [16] reveals statistically significant differences between Chinese and British students when using Virtual Spaces. After analysing 60 MSN virtual spaces, the study shows that the role of culture is important in online communication. Chinese students are more polite when interacting on Virtual spaces than the British. Chinese students pay more attention in designing their space as they care more about the opinion of their friends.

3.2.17 Facebook

The most successful SNS website globally today is Facebook, both in terms of users and time spent on the site [61]. Facebook allows users to create and manage their profile according to their own preferences. Users may upload a profile photo and provide information about them. For instance, users can disclose personal information such as their phone number, email address or education level. As soon as a profile is set up users can add friends with whom they usually have some type of an offline connection [22, 46], Facebook users can share a video, post a comment, "like" a photo, chat or even make a video call.

To protect user's privacy, Facebook allows users to change their default privacy settings. For instance, users can restrict others from posting comments on their own

wall, or restrict other users from viewing content posted on their profile. Age is an important role on users' perception towards privacy. Ur and Wang [67] demonstrate that younger Hungarians do not pay much attention to privacy settings on Facebook in contrast to elderly.

Facebook provides a platform to *"connect and share with people in your life"*. Recently, businesses have identified that the use of social networks is creating new business opportunities. To take advantage of social networks, the current trend of businesses is to create, maintain and promote a Facebook page. This implies inviting Facebook users to "like" a Facebook business page. It is a new way for companies to promote their products or services and to keep potential customers informed about the company's latest news. It seems that Facebook is becoming more than just a social network site. Little research, however, has concentrated on cultural differences on how people from different cultural backgrounds interact with Facebook.

Facebook is a widely accepted SNS by users all over the world. It is therefore interesting to examine the reasons why people use Facebook. The question though is whether social networks share the same characteristics as other web systems. Nadkarni and Hofmann [51] review literature to describe why people use Facebook. The study concludes into two primary reasons: the need of people for self-promotion and the need to belong. These two factors are influenced by other characteristics such as cultural background, shyness, neuroticism or other personal characteristics. The study stresses the need for further research on the role of culture in Facebook usage. It observes that people in individualistic societies use Facebook for self-promotion while in collectivistic for the need to belong. They observe that users in individualistic societies may raise controversial topics compared to users in collectivistic societies. Additionally, users in collectivistic societies may use Facebook for more frequent interactions with their close friends compared to those in individualistic ones [51]. The need for popularity is the primary reason for users to disclose a lot of personal information although concerns about privacy exist [11]. This type of behaviour, though, requires further investigation so as to measure to what extend privacy really matters for users.

The usage of Facebook is also associated with the personality of users. Ross et al. [58], show that extrovert users are members of more Facebook group pages than others. The study underlines that extroverts do not have more Facebook friends than others. The reason for this, as indicated in this study, is the fact that these people do not see Facebook as a substitute tool of the real-world communication. The study also shows that motivation is the primary reason for using Facebook. Lampe et al. [46] indicate that Facebook friends are usually people we meet

in the real world and add them as friends to learn more about them. This is in line with the findings of other studies which report that Facebook can satisfy the need of people to keep in touch with old friends [22]. This study [46] also mentions that Facebook can act as a beneficial tool for those with lower levels of self-worth and life fulfilment.

Previous studies also examine the reason why Facebook users continue to use Facebook after registration. A study by Ferebee and Davis [25] demonstrate that users who join Facebook and upload a profile photo or join a group are more likely to continue using Facebook in contrast to those who do not [25]. One in five American SNS users belong to a group associated with a political party [55].

3.2.18 Invisible cultural attributes in Facebook

Grevet et al. [33] state that our Facebook friends usually share common interests with us or are perceived like us. The study notes that users tend to avoid posting political comments in case of an opposite opinion or disagreement with other user posts. Engaging in a political disagreement in Facebook can lead to "unfriending" the other user, who may have an opposite opinion. Karl et al. [42] examine cultural differences of German and US students according to the number of problematic content (i.e. substance abuse) posted in their profiles. The study reports that the ratio of US students posting problematic content on their Facebook page is much higher than German students. They indicate that this behaviour is partially affected by the countries' cultures. According to Hofstede [30] USA is much more individualistic country and has a much lower uncertainty avoidance level than Germany.

Vasalou et al.[68] show that Greek users of Facebook do not consider status updates as important as US users do. This study [68] also reports that Facebook groups are more important for UK users compared to US users. For Italians Facebook groups and games are more important compared to US users and for French status updates and photographs are less important compared to US users [68].

Peters et al. [53] examine the cultural differences between Namimbian and US Facebook users. According to this study [53], Namimbians use Facebook primarily for connecting with old friends or making new friends. It also provides them the opportunity to chat with friends for free as sending text messages via a mobile device implies charges by their mobile network operator. Namimbians tend to accept all friend requests even if the person sending the invitation is unknown to them. For them, accepting all friendship requests is a way to act politely. In contrast, US users tend to reject friendship requests by people that do not have any offline connection. This study also indicates that Namimbians use a self-presentation photo, while US users use a group photo as a profile photo.

DeAndrea et al. [17] examine how students express themselves on Facebook. This study [17] reveals that African Americans express themselves differently from Caucasian Americans and ethnic Asians. For instance, African Americans post more about their personality or other individual expressions. With regard to users' profile photo, the study shows that a group photo appears more in Caucasian Americans profiles in contrast to African Americans and ethnic Asians who prefer self-photos [17].

Previous studies show that although localized systems sometimes exist (i.e. e-commerce systems, social networks), users tend to prefer well-known international systems over their own local ones [34, 67]. It is believed that this behaviour is because local systems usually fail to follow important cultural characteristics. Although they exist only in a specific country, users tend to prefer international brands. Ur and Wang [67] demonstrate the transition of users from a local Hungarian social network (iWiW) to an international one (Facebook). They also examine how people use a social network according to their age group. The study shows that Hungarians aged 30 years or older share much less on Facebook than those under 30. The recent history of Hungary and culture seems to play a significant role in the behaviour of Hungarians on Facebook. For instance, the "older" generation avoids sharing personal information excessively. They dislike being documented as they link it with the existence of a secret police when Hungary was a former communist country [67].

As Facebook has such a huge success, it is essential to list the reasons behind it. First, it promotes real relationships. For instance, it promotes accepting friends only from people you know and trust. As a result, users have friends on their network of people they know and trust. The number of strangers does not exceed the number of real friends. Other similar SNSs failed because of the number of strangers the users had in their circle of friends, making them feel uncomfortable. Second, privacy settings can be adapted according to user preferences. Third, Facebook was exclusively used during the early stages of operation. Facebook at the beginning was accessible only by students at Harvard University. Then it expanded with few more schools. The smooth expansion and at the same time its exclusiveness made Facebook a trusted SNS. Finally, keeping users active all time by sending by posts, news feed, likes and all other Facebook functions is yet another reason for its success [61].

3.2.19 Twitter

Twitter is another social network which counts about 271 million monthly active users [66]. Twitter is characterized by the limited number of characters in messages sent by its users (tweets) to only 140 per tweet. Unlike Facebook, tweets sent on Twitter are public and searchable.

3.2.20 Invisible cultural attributes in twitter

Gavilanes [28] examines tweets and reports some differences of how people from different countries use Twitter to express themselves. This study demonstrates that Indonesian users send more tweets compared to users of other countries. The study indicates that the percentage of tweets sent by Indonesians mentioning other users is 60 %. Moreover, the study underlines the differences in the mood of Spanish and English tweets [28]. In a similar study, Gavilanes et al. examine Twitter communication of users across different cultural backgrounds. The study points at the strong negative effect of culture when combined with language that creates a barrier in inter-cultural communication [29].

4 Conclusion

The primary purpose of this study is to increase cultural awareness of people involved in cross-cultural HCI projects. Many cross-cultural studies report that culture stands as an obstacle towards the acceptance of a system. The current study can be used as a source of information for people who are interested to learn more about the influence of culture or how to design with culture in mind. It is especially valuable for web and software designers and developers or business managers. Overall, this study reveals the importance of culture in interface design and the influence it has on people's perceptions.

A universal user interface widely accepted across regions seems to be very hard to implement. The design of a user interface must take into consideration those visible and invisible cultural characteristics to increase user acceptance. A paradigm that is followed by Facebook, one of the big internet players, is to design the core platform and then adapt its user interface to respect the culture of its users. It seems that adapting a user interface to respect cultural values of the target culture is inevitable.

Social Networks appear not to follow exactly the same behaviour as other HCI systems. A social network is not a static website, not an e-commerce site and neither a business software application. The various activities users can have in Facebook satisfy their needs, regardless of their cultural background. Some functions that Facebook provides seem to satisfy a specific cultural group, while some others satisfy a different cultural group. Culture seems to partly act as a driver towards their willingness to use it. Compared to e-commerce systems, worry of disclosing bank account information is eliminated as it is not required.

Social connectedness in social networks may have a stronger influence than high uncertainty avoidance levels. For instance, in low individualism and high uncertainty avoidance cultures privacy considerations or concerns that inhibit the adoption of a social network site may be reduced due to the strong effect of social connectedness of social networks. Cyprus, for example of low individualism (IDV) and high uncertainty avoidance (UAI) had the largest number of users in proportion to its population as reported by Pingdom in 2011 [13].

In a global business environment, managers and employees need to collaborate with business partners around the world. Communication problems lead to misunderstandings and can be avoided when people are aware of the cultural values. The same communication difficulties apply in HCI. The design of a web or software user interface must respect users' cultural values. Users may reject the use of a system if it fails to respect their cultural background. For this reason some studies demonstrate the necessity for cultural awareness and the use of tools for educating people about culture to avoid culture conflicts. Understanding cultural differences is therefore important for the success of any project. It is essential for successful collaboration with business partners abroad and at the same time, it is essential to deliver the most effective and highly acceptable solution to the end user.

This study shows the importance of culture in HCI. Before the design of any interactive system, the users' culture must carefully be taken into consideration. Practitioners need to be fully aware of how culture can influence their design. That is the reason why this study focuses on reviewing recent studies of culture in HCI. It can be considered as an initial step towards increasing cultural awareness among practitioners. These may be user experience designers/analysts, ethnographers, social-media professionals, mobile product/service developers, academics/researchers, anthropologists, interaction designers and many more. Culture will continue to influence communication, whether online or offline. Cultural differences of people will continue to exist. Most probably, more studies showing cultural differences in HCI will be available in the near future. The necessity therefore for adapting a user interface to the target culture is unavoidable.

With the advancements of the Internet and the World Wide Web, the whole world becomes a smaller place. Communication with people across different regions through Internet is much easier now. At the same time, technology reveals those hidden cultural differences between people. It is a question to ask though whether computer-mediated communication will only remind us of these differences or will overcome them. It is important to examine in the future the effects of frequent communication with people from different cultural backgrounds. Can

one behave in a different way so as to reduce cultural conflicts? It is believed that this may be possible for users coming from collectivist cultures but what happens with users of individualistic ones? Nevertheless, people will continue to use their own language, follow their religion, believe in their own symbols and heroes and follow the tradition of their culture. Inevitably, these characteristics must be respected in any HCI system. What would be beneficial to investigate in the future though, is how and to what extend do the technological advancements influence the behaviour of people and if this is enough to partly change some of their cultural characteristics.

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