One size fits many Westerners: How Cultural Abilities Challenge UI Design

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Abstract

Cultural influences on our behavior are partly reflected in neuro-anatomical changes in our brains, altering our abilities to perceive and interpret information. This paper points out possible consequences of such "cultural abilities" for user interface design, and outlines challenges for systems that adapt to their users. Specifically, we describe how culture could influence our design decisions of when, how, what, why, and where to adapt.

Introduction

Our ability to visually perceive and interpret information is a precondition for an efficient handling of graphical user interfaces. While we usually assume that all human beings accomplish this sense-making in very similar ways, this ignores behavioral and neurological findings showing that *how* we we perceive information is strongly influenced by our cultural background [13, 14, 8, 7].

In the field of Human-Computer Interaction, researchers have often pointed out that interface designs differ between countries [5, 2]. For example, websites designed by members of Eastern cultures are often thought to be much more visually complex and colorful than those in Western cultures [4]. The information density even varies between websites of different European countries [2]. Research suggests that such differences in designs result from variances in people's visual perception abilities, which are shaped by our culture [14].

Culture has been regarded as an umbrella term for aspects in life that influence our thinking [9]. These influences include the

language(s) we speak, read and write, the way our parents, and school teachers educate us, societal and organizational rules and practices, our education level, or religion [11]. We argue that these cultural influences affect how users interact with interfaces, and that there is a need to integrate such "cultural abilities" into current approaches to systems that adapt to their users.

Influences of Culture on Our Abilities

Results from behavioral studies suggest that a person's cultural background can be correlated with certain preferences and abilities [13, 14]. Recent neurocognitive studies support these findings by showing that cultural exposure leads to neuro-anatomical changes in the brain [8, 7]. Similar to the demonstrable increase in volume of musicians' transverse temporal gyrus [16], which is responsible for processing incoming auditory information, cultural practices seem to alter our neural activation patterns. Our perception processing changes according to what our environment (i.e. the cultural exposure) teaches us to focus our visual attention on. As a consequence, some perceptual differences are positively correlated with increasing age. While Westerners have been shown to generally attend to individual objects more than East Asians [8], the corresponding increased activity in the lateral occipital complex, responsible for object recognition, seems to be more distinct in elderly Westerners [7]. The cause of this finding could be attributed to the individualist experiences of Westerners, whose societies emphasize the goals of an individual [9]. The older someone gets, the more do these societal values influence the brain. The collectivist minds of many East Asians, in contrast, seem to result in greater neural engagement if the background of an image was changed, and this was also shown to affect their object memory [7]. This is very likely to impact how users respond to changes on the interface: *How would we draw a user's attention to a certain area on the screen if designing for such different perceptual abilities? Could error messages be shown in the background for certain cultural groups without interrupting the primary task?*

The exposure to an individualist versus a collectivist society has been also found to influence object grouping and categorization. Individualist Westerners seem to emphasize categories, and usually group objects according to their taxonomic classification, for example monkey and panda [10]. East Asians, in contrast, were shown to organize objects based on their relationships to one another (e.g., monkey and banana) [10]. *If we organize our world differently, should we also organize our interfaces differently?* While the varying preferences in object grouping are thought to be mainly due to differences in societal structure, researchers have also argued that it is the linguistic organization of the language we speak that determines our perception of focal and background elements [13]. The preoccupation with focal objects found in Westerners, for example, could be the result of grammatical training: Western children are often taught nouns first, and with that they strengthen those neurocognitive regions that are responsible for categorizing and focusing on central objects. This is also believed to foster analytic thinking [13]. East Asian children, in contrast, usually acquire a much broader vocabulary of verbs first, which might be the reason that they develop holistic thinking patterns, and later emphasize relationships between objects more than Westerners [13]. Analytic versus holistic thinking has been shown to affect whether we scan web sites in a circular manner (Easterners), or sequentially traverse different areas (Westerners) [6]. *Does this have consequences for the arrangement of interface components, or the level of information density we can handle on our user interfaces?*
Similarly, a language's word pool has been discussed as the reason for some cultures not perceiving the difference between certain colors, such as between green and blue [12]. Russians, for example, perceive a wider range of different blues than people speaking other languages [1]. *Why don't our interfaces adapt to and make use of such color sensitivities?*
Language is also thought to improve navigational capabilities: The Kuuk Thaayorre, an aboriginal community in Australia, for example, have been found to define their space with the help of cardinal

directions. As a result of this constant training, they find it much easier to stay oriented even in unfamiliar environments [1]. The Kuuk Thaayorre participants also sorted cards in a temporal order from east to west, no matter which direction they were facing [1]. While it is usually a language's reading orientation that is responsible for the temporal ordering (e.g. people who read from right-to-left will arrange events so that time proceeds from right to left), the finding that some cultures focus on cardinal directions immediately becomes a new challenge for user interface design. *Should the mobile phones of the Kuuk Thaayorre orient interface components depending on changing cardinal directions?*

The start location of our intuitively perceived ordering direction also influences people's spatial cognition. The reading direction impacts our center of attention to the point that we pay less attention to what is at the opposite corner of our start location (i.e. the bottom right corner for left-to-right readers) [3]. Thus, the spatial routines we apply when reading and writing determine the abilities of literate humans in terms of our focus of attention, and they influence the order in which we intuitively process the various interface components. *So where should we place the most important or most used interface components?*

Apart from visual perception abilities, culture might be also the reason why we differ in our ability to cope with situations of uncertainty. As an example, consider the "lost in hyperspace" feeling that the many hyperlinks in the WWW are thought to cause in some people. Several studies suggest that users of certain national cultures (e.g. many Eastern countries) are more likely to develop this feeling than others [2]. These users might feel overwhelmed by the number of navigation possibilities, and they might be better off with a central starting point. *Would the World Wide Web look differently if designed by those users?*

Revising Our Perception of When, How, What, Why, and Where to Adapt

The questions posed in the previous section demonstrate that abilities have to be seen in a hugely diverse (cultural) context. This poses challenges to designing systems that are able to adapt to their users:

When and how to adapt: The timing of adaptations, as well as the process of introducing changes to the interface must be turned into dynamic decisions based on the individual cultural abilities of a user to perceive and cope with changes to the interface. Firstly, a user's culture determines the interruptibility of users, and thus, when it is best to introduce new adaptations. Secondly, a different cultural background influences *how* users should be made aware of ongoing adaptations. This is strongly related to the amount of control and choice that users prefer: Some cultures might treasure the possibility to accept or reject proposed changes to the interface explicitly, while others might not need the feeling of control as much, or even feel overwhelmed by too many choices.

What to adapt: We have to extend the design space for a holistic approach to ability-sensitive intelligent systems. Solutions for adapting to users in the Western world have to be extended to other parts of this world by defining new design variants for specific cultural abilities.

Why to adapt: A more comprehensive understanding of the necessity to cater for differences in users' abilities will help us to provide improved interface adaptations. Which of the different cultural abilities impact users' satisfaction and performance, and thus, require adaptations? For this, we also need to find new data-driven methods to detect abilities, including those that might not express themselves through interaction particularities.

Where to adapt: With mobile devices on the rise, we will have to decide where and in what situations it is necessary to adapt to the particular context of users. For some users we might need to consider cardinal directions for adapting the interface. For others, an overload of peripheral information might impact the cognitive resources necessary to concentrate on a particular interface and task, thus, requiring less complexity.

Outlook: The Design Space for Cultural Abilities

Our previous work focused on adapting the design and workflows of user interfaces to cultural background, showing that this can immensely increase users' work efficiency and satisfaction [15]. Encouraged by these results, we would like to explore new design spaces to analyze whether previously ignored interaction paradigms might further improve the performance of users with different cultural abilities. Specifically, we will generate new design possibilities for user interfaces based on the abstract suggestions of behavioral and neurocognitive studies, and evaluate them with users from various cultural backgrounds. We believe that only if we understand the effects of cultural abilities on the design space will we be able to provide user interfaces beyond a one-size-fits-many-Westerners approach.

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