Culture and user-interface design for older users in Malaysia

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S. Hisham, A.D.N Edwards. Culture and user-interface design for older users in Malaysia. Gerontechnology 2007; 6(4):217-223. The implications of age-related changes in perceptual, cognitive and psycho-motor abilities for older users' computer interaction are well-documented. Although studies in Age Associated Memory Impairment (AAMI) show that semantic memory is unaffected by ageing, many researches in the area of computing and older users only emphasise working memory capabilities. Cultural norms and knowledge learned from living in a specific environment tend to remain as people get older. Culture norms also have a significant impact on users' acceptance and performance with computer technology. To demonstrate such impact, this paper reviews listening and speaking modes using a Malaysian scenario.

Key words: ageing, older adults, memory, culture, user-interface design

Learning to use a computer is an enthralling experience for many older persons. This is mainly because many of them have not had the opportunity to use computers in their younger age and usage was limited to certain work areas. As adults get older, they can experience a wide range of age-related impairments including loss of vision, hearing, memory and mobility. The combined effects of these can contribute to a loss of confidence and difficulties in orientation and absorption of information[1]. Age-related declines occur in most component processes of cognition including the attention process, working memory, information-processing speed, encoding and retrieval process in memory, and discourse comprehension[2]. Hence, to learn to use computers at an older age represents considerable challenges to older people's perception and cognition abilities.

Researches in ageing and cognition have shown that semantic memory is not affected by ageing. Fisk et al.[3] suggest it is essential for interface designers to make use of such semantic memory in their design especially for older people. Semantic memory can be thought of as permanent storage of factual information that accrues through a lifetime of learning[3]. It stores information such as the meaning of words, historical facts and general knowledge. The information stored varies according to the individual social environment experienced. As people age, they hold the same pattern of thinking, acting, communication style and behaviours which they learn from living in a specific culture. As Yeo[4] suggests every member of a cultural group possesses similar attitudes and behaviours, as well, as thinks and acts in recognisably similar ways given the same situations. Members of a similar cultural group are likely to perceive an artefact as having the same significance. This may also influence their perception, preferences and acceptance of the user-interface as well as their interaction with software applications or websites. Contrary to the above suggestion, many of the current studies regarding the implications of ageing for designers focus on utilising older people's working memory functions.

The implications of ageing are more apparent outside the developed countries

due to the fact that research regarding the influence of ageing on computing use is mainly conducted in Western countries. This has become a barrier to older users in other countries like Malaysia because they possess different sets of cultural values. Malaysian older users are not only struggling with their age-related difficulties, but at the same time they need to learn to use an interface which has been designed outside of their cultural knowledge. This has hindered many Malaysian older users from gaining full benefits of their computer and the Internet partnership. Studies in Malaysia[5] indicate there is the potential for using the computer and the internet for older users in Malaysia as platforms for communication and lifelong education.

This research-in-progress is investigating the roles of culture in user-interface design for Malaysian older users. The main objective is to adapt cultural markers in user-interface design to encourage more Malaysian older people to embrace computer use and to facilitate their interaction with computers and the internet.

Semantic vs. working memory

Using a computer and the internet requires large and complex cognitive activities. Dickinson et al.[6] point out computer use does not inevitably lead to successful internet use. The hypertext nature of the Internet is nonlinear and the freedoms as well as flexibility of hypertext systems are sometimes burdensome to users[2]. Cognitive overhead and disorientation are two common problems resulting from hypertext with not enough navigation support. Conklin[7] defined cognitive overhead as 'extra effort and concentration to maintain several tasks or trials simultaneously'. Disorientation is defined as 'the tendency to lose the sense of location and direction in a nonlinear document'.

The wide range of websites with different interfaces, contents and presentations also means that skills required for learning to use one website do not necessarily transfer easily to other websites[6]. As older people learn new sets of information and skills, this new knowledge needs to be transferred from short-term to long-term memory. This is where the locus of the problem is for many older users due to increasing workloads in their short-term memory. Nonetheless, older users' interaction with computers could be improved by providing a more intuitive and accessible user-interface. This could be achieved by making use of semantic memory that is unaffected by ageing.

Salthouse[8] indicates that any discussion of the relations between ageing and cognition must acknowledge a distinction between two types of cognition that are referred to as fluid and crystallised cognitive abilities or intelligence. Fluid abilities include various measures of reasoning (including both causal reasoning and deductive reasoning), memory, and spatial performance. Fluid abilities can be characterised as reflecting the efficiency of processing at the time of assessment. In contrast, crystallised abilities are evaluated with measures of word meanings, general information, and other forms of knowledge. Crystallised abilities tend to reflect the accumulated products of processing carried out in the past. The relations of age to these two forms of cognition are quite different. Performance in crystallised cognition tends to remain stable or possibly even increase slightly across most of the adult years' whereas increased age is associated with decreases in many measures of fluid cognition[8]. Therefore, it is relevant and important for user-interface designers to use information stored in semantic memory (for instance culture norms, symbols and colours) in their design, particularly when designing for older people.

In the area of user-interface design for older people, many of the literature surveys only highlight the implication of ageing and its relation to fluid cognitive abilities.

Salthouse[8] indicates two primary reasons for this emphasis as follows:
(i) Many researchers probably believe that explanations are clearly needed to account for the differences that have been reported (as in fluid abilities), but a lack of difference (as in crystallised abilities) does not necessarily require an explanation.
(ii) Fluid abilities are assumed to reflect the individual's current status. They are often considered to be of greater clinical and practical significance than crystallised abilities that are assumed to represent the highest level the individual achieved at an earlier stage in their life.
The above analyses support the main idea of this research to incorporate cultural markers in the development of localised user-interface design for Malaysian older users.

Two modes

There are significant roles of culture in human cognitive process as the user interprets new information on the basis of their existing mental models[9]. According to Gorlenko[10], user needs and mental models are influenced by an even broader variety of cultural characteristics than user profiles. Mental models represent what a user believes to be true about something, based on previous experience or understanding (for instance classifications, vocabulary, processes, cause and effect)[11].

The human cognitive process described above has some similarities with listening and speaking modes that will be discussed next. Human cognitive processes require huge amounts of perceptual (attention), cognitive (identification and recognition) and mobility (response) tasks. This cognitive load is one of the major difficulties for many older users notably with regard to computer activities.

Listening mode

Ito and Nakakoji[12] define listening mode as a state in which people are presented with a computer's reaction. This refers to the presentation of information by the system such as presentation of messages, change of icon shape or generation of sound. The listening mode is divided into three phases as described below.

Perception

Perception is the recognition phase when people become aware of the changes that affect the object displayed on the screen. In order for the user to recognise the object, the object must catch their attention. For instance, a user recognises that a rectangular prompt box displayed on the screen has changed colour. This phase has the least cultural impact. Therefore, Ito and Nakakoji[12] suggest that the design in this phase should be done by considering cognitive aspects of users. Restricted perceptive and cognitive abilities affect the older user's ability to identify and recognise objects on the screen. In order to assist older users in this stage, appropriate accessibility features would be helpful to identify objects on the screen. For example, large non-decorative text on the prompt box is suitable for older users.

Semantic association

In the semantic association phase, people associate semantic meanings to what they have perceived in the preceding perception phase. In human cognitive processes[13], semantic association is known as the identification and recognition stage. For instance, the user recognises that the list of characters written on the prompt box is a message written in English. According to Ito and Nakakoji[12], representations related to one semantic association phase should be more culture-sensitive. These culture-specific representations include surface level adjustments such as languages, symbols, colour, icons, text and number formats. The user identifies the signal (object in this case) based on his/her knowledge and general context in identification and recognition stage.

The usage of culture-specific cues (for instance metaphors) in user-interface design makes the interface more intuitive to the users, especially older people. Furthermore, the use of cultural markers (for instance colours and text layout) may attract users from the same culture. For example, the use of official national colours could be associated to national identity.

Another impediment for older people in this phase is related to Age Associated Memory Impairments (AAMI). Once the signal is identified it will be transferred to long-term memory. According to Hunt[14], the locus of the problem for older people seems to be in the transfer (or encoding) of information from short-term memory to long-term memory. As a result, there is an increased workload placed upon the memory. Thus, the use of culture-specific cues will help older persons to encode the information and then recall and retrieve it from their long-term memory as well as reduce the workload placed upon their memory.

Logical reasoning

In the logical reasoning phase, the user reasons about the information or behaviours presented by a computer. The user is required to interpret the feedback sent by the computer, solve the problem and make a decision for the next action. For instance, the user tries to understand why a warning message is presented and how it relates to their previous action. This phase has the most cultural dependence compared to the previous phases. It is influenced most by social norms and background culture[12].

Reasoning and problem solving in this stage require concentration. Any distraction could cause loss in concentration, reducing speed and sometimes accuracy of performance. Due to AAMI, many older persons find difficulties in concentrating as they are easily distracted by their surroundings. Moreover, concentration also demands cognitive and physical effort that might cause mental fatigue, physical fatigue and disorientation for many older people. Similar to the previous phase, increasing workload in memory is also one of the obstacles for older people in this phase.

Speaking mode

The speaking mode comprises processes in which people give instructions to a computer system as responses to computer reactions in listening mode. Ito and Nakakoji[12] in their work found that most cross-cultural interface designs do not give much attention to the users' expectations when they give a certain instruction to the application. The speaking mode represents the process taking place in the response stage. The speaking mode comprises four phases: affordance perception, applicability check, enactment with expectations, confirmation.

Affordance perception

Affordance perception consists of the phases in listening mode as discussed earlier. In this stage, users identify what they can do with the presentations displayed by the application. Before the user can decide on an appropriate response they should be able to identify and recognise the feedback sent by the computer. Norman[15] defines affordance as the perceived and actual properties of an object, primarily those fundamental properties that determine just how the object could possibly be used. For instance, colour highlight in text fields afford typing and a raised-edge button affords clicking.

Many novice users misperceive affordance. For example, older users might click on items that are not links (such as table headings and bullets). The idea is to click on any items that seem to meet their expectations for whatever target they are seeking. As suggested in the perception phase of listening mode, the design of this phase should consider perceptual and cognitive aspects of users especially when older users are taken into account.

Applicability check

In the applicability stage, the user validates whether the chosen action plan will actually let them do what they intended. Users' attitudes for checking the applicability of what they planned to do in the preceding affordance phase differ across cultures[12]. For example, a trial-and-error method is perceived as tedious and time consuming in Japan, whereas some cultures associate the method with freedom and exploration, which have positive connotations. Based on this example, it shows cultural background has a significant influence in shaping the user's confidence when interacting with the applications.

People use semantic consistency in checking applicability of their decisions. Culture affects how consistently semantics are assigned to representations on a user-interface display in terms of the degree of appreciation for particularity[12]. For example, some cultures value particularism[12] and like to have a specific style of interface object assigned to each task. In this stage older users need to reason about their selected action and they may take a longer time before proceeding to their action plan. Issues related to concentration and increasing workload in working memory arise in this phase. Failure to concentrate and being easily distracted would cause irritation and affect older users confidence to perform desired actions. Chadwick-Dias et al.[16] report that older users spend more time reading text and instruction before clicking and even ponder the pros and cons of clicking before attempting to click a link. The use of culture-specific cues (for instance, icons) should be used to reduce workload in working memory.

Enactment with expectations

In this phase users perform their selected action plan. Ito and Nakakoji[12] have quoted from Whorf (1956) 'the diversity of language influences the thoughts and actions of people who speak them'. For example, when people perform actions in Japanese, they tend to identify objects then designate which action to perform to the objects. This may stem from the fact in Japanese grammar a subject is followed by objects followed by a verb. This may affect the translation of menus and help files in the localisation process. Some languages may have different connotations for literally translated terms. This has implications for the localisation of user-interfaces such as translation of menus and computer and web terminologies.

Culture has an impact in the enactment phase, both on how the enactment process is indicated or described to users. For instance, in Western cultures people prefer descriptions written in a declarative manner, while in the Oriental and Russian cultures people like to have a description written in a procedural manner. This also applies to how people from different cultures perform their jobs and tasks. In some cultures people prefer processing jobs in parallel, while in other cultures tasks should be performed sequentially. To assist older users in specific cultures the information should be presented based on language rules, hierarchies in mental models and social norms. Regardless of cultural background, older users would benefit from a simple, clear and restricted amount of information used to describe the enactment process.

Confirmation

Users need to confirm that their action in the previous phase has been carried out as expected. Culture has the most impact in this phase.

Based on the Japanese scenario discussed by Ito and Nakakoji[12], the biggest difference within culture in this phase is the perception of time. This refers to how much the user values the speed of service. An interesting example of the Japanese culture is that Japanese users demonstrate more patience in achieving a long-term goal in application. Therefore, they are willing to spend time to read the manual

before they start to use the application. This is to avoid errors and breakdowns as much as possible.

Another aspect relating to perception of time is the communication overlap in social interaction. Studies have shown that the time interval between two people talking in a conversation differs in various languages[12]. In many Western languages, they alternate; in an Asian language like Malay, they alternate and pause for a while; and in the Latin languages, the two conversations overlap. Similarly to the previous phase, older people would benefit from a simple, clear and intuitive confirmation display.

Discussion

Review of the above listening and speaking modes shows why it is important to consider culture in user-interface design for older users. Some of the older users' needs discussed in the listening and speaking modes may override the cultural aspects. For example, user-interface design that considers cognitive barriers of older people in the perception and confirmation phases of speaking mode will benefit larger groups of users regardless of their cultural background. From this review, the roles of culture in user-interface design are classified into three categories:

(i) To attract and encourage new users to use a computer application in the targeted culture.

(ii) To improve the localisation approach. This is a lesson learnt from the low acceptance of Malay Interface Pack for Windows XP and Microsoft Office 2003 by Microsoft Malaysia.

(iii) To cater to older users' needs which differ from one culture to another. The differences comprise preferences (for instance graphical layout), way of use, expectations and pattern of behaviours.

Conclusion

The idea presented in this paper is to incorporate culture and ageing needs in user interface design for older users. The rationale is based on two arguments. First, semantic memory is unaffected by ageing. Therefore, as people age, they will hold the same pattern of thinking, acting, communications style and behaviours which they learn from living in a specific culture. This influences their perception, acceptance and preferences of a user-interface as well as their interaction with software applications or websites. Secondly, current software applications are mainly produced and developed in Western countries which adopt their cultural elements in user-interface design. This has become a barrier to users from Eastern countries like Malaysia that possess different sets of cultural values. Designers are often unable to filter out user-interface features which can handicap users from other cultures, especially older users. In human-computer interaction (HCI) research, ageing and culture are often considered separate research areas. Moreover, the research in these areas is mainly conducted in Western countries. This has contributed to a gap in current accessibility and localisation guidelines. The gap is more apparent outside the English-speaking countries due to the fact that the current user-interface guidelines for older users tend to generalise cultural characteristics. This is also the case for localisation guidelines which stereotype older users as a less profitable market.

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