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TOWARDS MOBILE DESIGN GUIDELINES-BASED CULTURAL VALUES FOR ELDERLY ARABIC USERS

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ABSTRACT

The way elderly people interact with technology has been emphasized in previous studies to involve numerous cultural aspects related to language, religion, habits and customs. Despite the current calls for standardizing the design of user interface (UI), there appears to be a notable lack in the design of the mobile UI in order to meet the expectations of elderly users. This study was conducted as an attempt to address the key mobile UI design guidelines based on the cultural values of Arabic elderly users. An interview was carried out with 40 elderly people to gather the necessary insights for proposing workable design guidelines for mobile applications. We found that elderly users' vision, trust, boredom, physical change, stress and confusion were the main cultural elements that elderly Arabic users are concerned about when designing the mobile UI. The results of this study may offer insightful directions to the design of mobile UI, thus increase satisfaction.

Keywords: culture; elderly users; mobile user interface; mobile application.

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1. INTRODUCTION

1.1.Introduction

The review of the previous design studies showed the need for customizing the users' experience when using technology. This is difficult when it comes to certain group of people where expectations and preferences may vary across domains. Users of mobile applications around the world approach the services in different ways depending on various cultural differences such as the different language, religion, habits and customs. Therefore, designing the mobile applications interface to be more user friendly is a critical factor for the successful of the applications and products. However, the design of UI for mobile phones for user-specific culture is not well addressed [1]. With limited studies on the design specifications for elderly people, it is assumed that examining certain cultural aspects in the design of mobile UI would significantly contribute to the overall usage experience. This led us to develop a set of guidelines specifically for Arabic users as an attempt to empower elderly usage experience of mobile application. According to the last statistics in 2017, the population of Arab countries totaled around 421 million which makes it 5.6 % of the world population, in which more than 175 million of them are using internet [2]. Based on the statistics, it is obvious that learning through mobile applications is of importance to the field of information technology, and among the Arab mobile users.

1.2.Research Background

The word 'culture' has many definitions and they differ from one author to the others, depending on its use [3]. According to [4], culture can be defined as "the collective programming of the mind which distinguishes the members of one group of people from another". Meanwhile, in [5] have provided the earliest definition of culture as "that complex whole which includes knowledge, belief, art, morals, law, customs and any other capabilities and habits acquired by man". In this study, the culture is considered as a collection of attributes such as language, religion, gender, habits, customs, ideas and laws that distinguish the members of one group of people from another. These cultural elements were studied from the perspective of elderly people in the Arabic world. Most developed world countries have accepted the chronological age of 65 years as a definition of elderly or older person [6].

The number of elderly people in the Arab world has increased rapidly. By the year 2050, the proportion of elderly people will exceed 20 % in 6 out of the 22 Arab countries and will range between 12% and 19 % in 9 others [7]. Most Arab countries will reach the peak of their demographic before 2030. The significant growth in the numbers of elderly makes the need to develop technologies for this user group to achieve their demands [8-9].

With the rapid growing of elderly population, their adoption of technology has increased throughout the years [10]. Usually, elderly faces many difficulties to use new technologies depending on the demographic characteristics such as income, education, geographical location, possible disabilities, as well as difficulties related to the complexity of new technology [11]. In addition, there are several factors that may contribute to elderly usage of technology, for example, digital skills and appropriate training [12-13]. On the other hand, the use of new technology among the elderly has a beneficial effect on their quality of life. Furthermore, understanding the difficulties face the elderly when using the technology will provide information that may significantly contribute to improve technology [14-15].

The review of the literature showed a limited research conducted to provide design solutions for elderly people in a mobile context [16]. In addition, none of these studies focus on Arabic elderly users. In [17] characterized the use of mobile applications by elderly for safety, emergency and security concerns. Some other studies were found to focus on the relationship between UI components and elderly preferences. For example, in [18] conducted a study on elderly users in Finland to enhance usability of mobile UI by studying font size of UI and the result showed that the font size play an important role in deign usefulness UI. In addition, in [19] carried out a study to simplify communication of health information for Remote Patient Monitoring (RPM) devices design. They particularly looked at the icon design, which was found to impose a direct impact on users' usage experience. In [20] carried out a study on elderly people to design guideline approach for UI by studying types of buttons according to its size and users' preferences to navigate. However, most of those previous studies did not consider the role of culture in their design practices.

1.3. Design Components

A user interface or UI involves various design elements that stimulate users' experience in a task-specific context. The components of UI listed below were repeatedly noted in the literature to impact on the users' use of the interface.

1.3.1.Color

Color has always been characterized to be an important aspect of the cultural design and has a direct impact on the design of UI, feelings and emotions [21]. For example, blue is commonly perceived as calming color, purple is dignified and stately, cheerfulness for yellow and the red is associated with passion and excitement [22-23]. The elderly people are less sensitive to color contrast than the younger people [24]. This decrement of capability applies to different ranges of color, especially in the blue and green range [25]. In addition, the type of color plays a significant role in the design UI. Therefore, it should be chosen clearly by balancing the three color properties such as value (light versus dark), hue (warm versus cool) and saturation (vivid versus dull) to create suitable contrast between letters and their background [26]. On the other hand, designers choose color for mobile applications based on the content and purpose of application and target audience. For example, when designers decided to design mobile UI, they usually consider formulating the type of color in order to reduce potential stress during its use.

1.3.2. Typefaces

Typefaces is another key element in the design of the mobile UI because. It has been shown in the literature that the use of typefaces can affect our moods, feeling, strength, silliness, elegance, agitation, friendliness, scariness and joy [27-28].The legibility of a typeface has some characteristics using in designing UIto distinguish one letter from another, such as character size, character height and character shapes [29-30].In addition, typefaces have direct impact on websites and mobile usage experience as they play a significant role in navigation, buttons, headings, contents and other important factors. Therefore, this component should be used appropriately according to the purpose and role of UI design by considering legibility and usability. A different number of Arabic fonts presently used by mobile users are believed to influence the overall usage experience. For example, the use of certain type of fonts when

presenting Arabic text may make it hard for users to recognize or make inferences from the text.

1.3.3.Layout

Layout refers to the arrangement of the items in accordance to certain order or organization. Layout has lately received additional concern in design related studies, probably because it stimulate users' processing of information [31]. In Arab culture, people read information from right to left and view content in a different manner than others. Therefore, it is necessary to keep the application simple with clear components to let a wide range of users able to use the application.

1.3.4.Icons and Symbols

Icons usually plays an important role in UI design.For this reason, designers and developers usually take into consideration this element to suite certain use. Previous studies found some difficulties in recognizing certain icons in different situations. For example, in Asia, people usually recognize more standard icons than Americans while the American people are claimed to recognize the abstract icons a lot more [32]. Thus, it is reasonable to say that the icons express information about functionality without using words. When the meaning of an icon or symbol is familiar to the user (e.g., door leads to the "exit"-view), the intended context can be recognized quickly, possibly more quickly than through reading a text message or label [33].

1.3.5.Language

The Arabic language is the mother tongue of more than 350 million people and contains 28 characters [34]. There are four alphabetic shapes: right connected shapes, left connected shapes, connected shapes and 60 isolated shapes [35]. The letter ع (Ein) is an example of how the letter structure changes in different positions within a word as follows: ع- ـعـ - ـع - عـ. Therefore, it is important to use formal Arabic language in the design of interface. In addition, the Arabic language is different from the English language in a number of areas such as the morphologies, grammatical rules, compositions, meanings, spelling and even the direction of writing. As such, the design experience may also vary as a result.

1.3.6. Images

Overall, images enhance user experience and thus play a significant role in the UI design. While in some cases, image content is offensive to users from certain cultures [36]. For

example, images of comic characters are used in different fields such as banking, insurance, etc. The literature showed that placing images when designing the UI may contribute to the overall experience of users [37].

1.3.7. Information Architecture

Information architecture refers to information presented in the user interface and its elements, such as icons, layouts, colors and buttons, the display of which should be based on the relative importance[38]. By giving more prominence to certain elements, UI designers determine which information a user sees first and the type of actions he/she can perform. In addition, content aimed at elderly users should align the key information in the central visual field [39].

2. METHODOLOGY

In order to identify user interface requirements for elderly Arab users, it is important to analyze the cultural influence on the acceptance of technologies and understand the Arab cultural aspects. This was the aim of the preliminary study, as a part of which challenges that Arabic elderly face when using mobile applications were identified. In addition, the Arab cultural aspects that influence UI design and rules that should be applied when designing UI for Arabic elderly were identified. To achieve these aims, qualitative approach through semi structured interviews was selected. A total of 40 Arabic elderly users were interviewed (the length of the individual interviews ranged from 30 to 40 minutes) and their responses to the following questions were analyzed:

- What are the main barriers and challenges that Arabic elderly users may face when using mobile UI?
- How can the design elements be used to make you perceive mobile UI as culturally supported?
- What rules should be applied when designing a mobile application interface for Arabic elderly users?
- Based on your experience, do the interfaces of current mobile applications aimed at Arabic elderly users reflect certain cultural values? How?
- Do you think that the current design of mobile UI for Arabic elderly population can benefit from cultural values?

- How is culture important to you in the design of mobile UI?

2.1. Procedure

Prior to the interview, each participant was given a brief overview of the present study. Each participant was informed that the interview session would consist of four parts: demographic assessment (Part A), current mobile UI components (Part B), barriers of using mobile apps (Part C) and aspects of Arabic culture (Part D). After the participants had consented to continue with the experiment, they were asked to complete the demographic assessment questionnaire which was read out to them. After that, the interview session began. The session was audio recorded for later analysis

3. RESULTS AND DISCUSSION

3.1. Demography

Out of the 40 participants; 23 of them were within the 60-64 age group, while 17 participants were within the 65-69 age group. In addition, 5 participants were within 70-74 age group. None of the participants aged 75 years and above reported using mobile apps.

3.2. Challenges of using mobile UI among Arabic elderly users

To identify the potential challenges faced by Arabic elderly users during use the mobile UI, they were asked to list the main issues associated with their usage of current mobile design. The result showed that aspects related to vision, physical change (shivering in the fingers or hand movements, slow movement), stress, boring and confusion were the main challenges found to face elderly people.

3.3. Shared cultural values among Arabic elderly users

After the users answered the questions related to UI elements and aspects of Arab culture, the elements of mobile UI and values of cultural aspects were determined (see Table 1).The collected UI elements compared with each other and then reorganized based on such criteria including similarity, inclusiveness and relevancy. Seven identified UI elements involving aspects related to avoid using small fonts, underline and italic font were addressed. In other words, the UI typeface should include design features and ensure better perceptual experience.Table1 indicates the findings of the interview among the elderly users.

Table1. UI and Arab culture aspects

No.	UI Components	Shared Concerns
1	Typeface	- Use 12 pt-14 pt font sizes. - Avoid italic or underline font style. - Use popular font type like Times New Roman. - In case using Arabic font, avoid some font types which are hard to read like الثلث- الكوفي - الاندلسي
2	Color	-Use Arab Islamic and culture colors like green, blue and black.
3	Icons	- Use large and meaningful symbols.
4	Languages	- Use standard words which are popular in the Arab world -Use Arab language or provide good translation from different languages to Arabic language.
5	Information architecture	-Use a simple design (group the same functions).
6	Layout	- Use layout from right to left.
7	Images	- Use images respect holy places, the culture and religion of users.

We found that elderly Arabic users preferred to use several known famous types of Arabic fonts such as Times New Roman and Arial and avoid other difficult typefaces such as Andalus, as these preferred fonts increase their acceptance and avoid confusion. As claimed byP1 "*Andalus font type is hard to read why used in design applications*". And P2 "*I prefer reading fonts types that I have studied in school books such as font "*الرقعة*"*".Images were also found to contribute to their overall aesthetics. The findings of this study indicate that the images used in UI design must comply with the Arab culture such as holy places, history, and religion. This was clearly stated by P3 "Some *applications contains images that are do not comply with our Arab customs, traditions and cultural heritage*". In [40] confirmed that images might create positive feelings and responses for using UI.

We also found that using cultural Arabic colors such as green, blue and black were mostly preferred by the participants in which green and blue colors were mostly recommended, as claimed by P4 "*When I see blue color, I feel relaxed*". P5 "*Green color does not cause pain in*

my eyes, while reading or using mobile apps". And P6 *"Sometimes I cannot read text correctly due to the brightness of background and this increases my stress and makes me feel confuse"*. This finding is supported by a number of studies such as that of[41].

Their study recommended using long-spectrum colors to enhance vision and reduce stress. The participants also preferred icons localized to Arab culture and they are a bit reserved on the icons designed according to Western cultural aspects such as cross and pig symbols as claimed by P7 *"Some of the symbols used in the applications harm and make fun of our beliefs and public figures"*. On the other hand, some users suggested some icons to use in mobile application to indicate particular domains. For example, they suggested using dome, mosque and crescents symbols to indicate religious applications.

As for the language, we found that using Arabic language in UI design will increase satisfaction of users toward using those applications. In addition, translation from English language to Arabic language requires a deep understanding of the Arabic language due to the fact that one Arabic word can carry several meanings in English. For example, the word "*فصول*" in Arabic has the meanings (chapters of a book), (seasons of year), (semesters in school) and (acts of a play) [42]. Some studies support the finding of this study pertaining to this language aspect. For example, in [43] shown that the usability of a user interface improves when the designer or developer of UI considers the users' native language in the design. Also, in [44] reported that translations of the contents, culture and context influence the way people perceive and react to website. As claimed by P8 *"There is a difference in the meaning of some words and their real meaning when converting the applications user interface from English to Arabic or vice versa.*And according to P9" *On one occasion I translated the page of poet Ahmed Matar (أحمد مطر) the translation was Ahmed rain. This is big mistake because the word "مطر" is the name of person while rain means the water flows from sky."*

Users of mobile applications have different cultural background. In order to assure that a wide range of different users be able to use the applications, it is essential for the layout to be simple and follow a specific culture that is recognizable amongst other applications. The statement made by [36] supports the findings of this study that elderly Arab users prefer the UI layout that is in line with the Arab culture in reading and writing from right to left to avoid

confusion. As claimed by P10 "*Often I find difficulties to control the format of text converted from English to Arabic*" and P11 "*It's hard to write Arabic text from left to right*".

Displaying information and grouping components on UI is important to make an application easy to use and achieve the level of satisfaction for its users. As stated by P12 "*Too many buttons and forms in apps make me bored and frustrated*". Also, as statedby P13 *"Ipreferapps which make me do my work in a simple and easy way"*. And P14 claimed "*When I make a mistake in entering the data, I will go back and entering the data again from the beginning*". The findings of this study supported by several studies such as [40] in that the information displayed on an interface needs to be concise and summarized accordingly.

4. CONCLUSION

In this study, we presented several UI elements that identified in according to the culture of elderly users. In other words, interface elements should be designed based on culture in order to make the use of mobile UI more appealing for elderly people. In addition, this paper reported some potential challenges that may encounter elderly users during mobile applications' usage, mostly related to the stress and vision of the display. Yet, future works are needed to validate the feasibility of the guidelines in task-specific context.

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