

Interface design features of mobile application for senior citizens

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ABSTRACT

Reading Al-Quran is one of spiritual activities and as for Muslims, and they believed God would reward those who read and practice it. In order to dedicate remaining years of their life to God and to bring peace of mind, most of the senior citizens are spending their time doing spiritual activities such as reciting Al-Quran. With the advancement of technology, the sources of Al-Quran are also changing. There are many Al-Quran application being developed in the market and can be download and install easily in mobile devices such as smartphone. However, the application that have been developed often ignored needs and limitation of senior users, that causing them to feel unease to use the mobile application. Hence, the purpose of this study is to investigate the user interface design principles of mobile Al-Quran application for senior citizens. For this purpose, the study has conducted a literature review, interview session usability study, the user interface design principles were identified. Using the principles, this study proposed a mobile application and an observation has been conducted with the senior citizens as a validation of the principles. Validation is based on usability evaluation on effectiveness, efficiency and satisfaction. The results show that the application is satisfactory and usable for the users. In future, the same research interest researcher can explore the audio and navigating in the interface by audio commands. The prototype could be extended to meet the needs of senior citizens that having the problem such as Parkinson and Alzheimer disease.

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1. INTRODUCTION

In the new era and technology, many mobile applications were developed rapidly. A mobile application is a program that specifically built and install in a smartphone, iPad, tablet PC and others and connected using wired or wireless network. The software is small and quick to download and update. Gadgets like smartphones are popular among children and teenagers. Numbers of mobile phone users in Malaysia are rapidly increases because of the evolution in telecommunication in our country. Based on study of the trend of smartphone and its usage behavior in Malaysia in 2012, 85 % of Malaysians are reported own mobile phones [1]. And among the population are senior citizen users. The usage of the technology not limited to their daily life but to achieve successful ageing. Smartphone becomes a crucial in their daily life because it allows them to communicate with family and friends, thus make them more independent and secure [2]. However, most of the senior citizens often facing declining of physical and mental abilities due to ageing factor, causing the confidence level to use mobile devices such as a smartphone reduced. Consequently, this research will study about Interface Design of Mobile Al-Quran Application for Senior

Citizens. Al-Quran is sacred, the most reliable and unchanged book from Allah since its revelation over 14 centuries [3]. People read Al- Quran using conventional reading method, which is printed version called Mushaf. Reading Al-Quran is one of spiritual activities and as for Muslims, and they believed God would reward those who read and practice it. In order to dedicate last years of their life to God and to bring peace of mind, most of the senior citizens are spending their time doing spiritual activities such as reading Al-Quran [4]. With the advancement of technology, the conventional reading of Al-Quran is also changing. There are many Al-Quran application being developed in the market and can be download and install easily in mobile devices such as smartphone. However, the current application that have been developed often ignored needs and limitation of senior citizens users, that causing them to feel unease to use the mobile application [4]. [2] State, there are several aging symptoms make seniors user feel unease to use the application in the smartphone due to vision impairment, motor difficulties and bad perception about smartphone. In a study by [5], most of the seniors are suffering vision impairment especially when reading. This unhealthy scenario will cause the gaps between senior citizens and the usage of mobile application in their daily lives. In order to support this problem, the interview has been conducted with nine (9) people of senior citizens, which consist of five (5) female and four (4) male in Manjung, Perak. Through the interview session, most of the senior citizens faced problems when using the current application, which is iQuran, which shows that the current application is, ignored needs and limitation of senior citizens. The issues are i) difficulty to read the text in the application due to small size of font used, ii) Size and design of graphics symbols, icon and labels in this application is small, iii) Some design of graphics symbols, icon and labels in this application is not understandable by senior citizens, and iv) the usage of background color is not suitable for the senior citizens. Thus, further study on suitable UI features need to be conducted in order to propose a usable platform for senior citizens of using mobile application. This study will help the researcher to get closely with seniors in order to identify issues faced by senior citizens when using current Mobile Al- Quran application, which is iQuran. Next, from this research the researcher can get the requirement for Al-Quran mobile application needs by the senior citizens. This will help the researcher to develop an Al-Quran mobile application that have a suitable interface design that tailored to senior citizens need and their abilities. Lastly, the usability of proposed application is being evaluate to the senior citizens in term of effectiveness, efficiency and satisfaction. From this usability evaluation, we can identify whether the proposed application is satisfactory and usable for the target users.

2. LITERATURE REVIEW

2.1. Senior Citizen

Nowadays, the aging population or known as senior citizen population is increasingly growing. In Malaysia, senior citizens are those who are 60 years and above with the average life expectancy for male is 72.3 years and 77.2 for female. In 2012, Malaysia's total population of senior citizens was 8.2% from the total population of the country (2.4 million out of 29.34 million). Like many other countries all over the world, Malaysia also experiencing the rapid growth of senior citizens due to declining fertility and longer life expectancy [6]. Expected by 2030, Malaysia will be in the category of the ageing nations with more than 15% of the population is senior citizens [5]. With the increasing number of aging populations, government needs to make a wise strategy in order to make them live better and happier in a country. The strategy is a crucial to ensure them live independently and achieve a good quality of life. According to [7], there are three types of senior citizens: fit, frail and disabled. Fit senior citizens not considering themselves as disabled but whose functionality, needs and wants to those they had when they were younger. Frail senior citizens considered as have one or more disabilities. They also have the general reduction in their other functionalities. And disabled person who grow older possesses a long-term disability that have affected the ageing process

Aging causes many problems on mental health [8] such as an inability to generate ideas, remembering, think and focus. According to [9], it involves attention process, working memory and problem solving. This situation is called aging and affects the ability to learn and memory loss [10]. The senior citizens usually cannot understand the application because the application was design with too many text, bright user interface and difficult in navigations. However, an effective interface helps the senior citizens using the application with less errors and confusion [11]. When the interface of the mobile application was designed poorly, many of senior citizens tend to blame themselves rather than the application. A mobile application with a correct mental model will helps the senior citizen users a lot when using the application. Correct mental model means the application is develop similar to something that the user already knew in the past. They will respond better to things that do exactly to what they expect.

Furthermore, senior citizens are particularly at risk with serious vision problem such as decrease sensitivity to color matching, difficulty focusing on things, decrease visibility in the dark and sensitivity to

glare [12]. Tendency of visual impairment are increases in the age of 50 and above [13]. Many of senior citizens need the assistance of bifocal lenses. They preferred the larger text and the bigger icons in the mobile application. The small text sizes cause the senior citizens hard on reading them. Even with the corrective lens, the senior citizens found that is hard to read. In addition, older eye only receives 1/3 of light compare to the people with age 20s. The lens color is slightly yellow color, so the world's color appears less blue. The senior citizens have a limited perception of color which has a shorter wavelength color like green and blue [10]. The senior citizens are hard to distinguish between subtle changes of blue and between shades of a red and purple. According to [14] senior citizens have less sensitivity to color contrast compare to younger people.

2.2. User Interface Design Features

Designing a good interface is not an easy task [15]. There are many steps to be understood in order to design good interfaces. These includes user's characteristics (for example how the user sees, understand and thinks), enhancing acceptance and comprehension of users by presentation of information visually and to control the movements of eyes and hands to reduce the risk of injury and fatigue. One of difficulties in adoption mobile application for the senior citizens is the complexity in term of interface design. According to [16], special interface is required to be designed for senior citizens for more efficient daily use. The design should fulfill all the needs by the senior citizens. There are some several improvements can be done on the interface of the mobile application for senior citizens to overcome the usability issues faced by senior citizens when interacting with mobile application. The main problem faced by the senior citizens is visibility. Many of senior citizens has shortsightedness problem and blurred vision. Most of the existing application interfaces were designed based on the suitability of users who do not have any vision problems or cognitive decline [10]. The characteristics of interface design for the senior citizens should in line with their level of visibility. Previous studies suggested an improvement on text used, choice of color used, and graphical content used.

Most of the information that an application needs to communicate with users usually carries out by the text. According to [17], senior citizens might gain better performance with text-based interface compared to graphic based- interface. The size of the text is dependent on the resolution of display screen. Typically, many existing applications use the small size of the text, but readable by the normal human eye. [18] Reviewed a wide range of researches on the text characteristics suitable for senior citizen users. He suggested that a suitable font for the senior citizen users are sans-serif fonts in size between 12-14 points, short line and left justified text to help senior citizens who have poor visibility to read. The selection of text also important to ensure that the use of the text type is not confusing and clearly can be understood by senior citizen users [19]. Senior citizens preferred simple text characteristics affected from their everyday reading experience such as newspapers, magazines, books that usually use normal text presentation [10]. [20] In his research reported, static and black text is suitable for senior citizen users for reading. He also added that moving text will increase the cognitive effort among the senior citizen users and might reduce the reading performance (speed, correctness, willingness). Many of senior citizens stated that their eyesight is weakening, dexterity and cognitive abilities are decreased [21].

Soft colors should be used in the application for senior citizens. This is because senior citizen users prone to vision problems when dealing with colors that are too bright [10]. Color differentiation between the content and background color of the application should be chosen precisely to highlight the text wanted to be shown to the senior citizen users. In a study by [22] stated that the usage of dark background in the application for senior citizens would reduce reading ability. And white background will give a better reading. Therefore, the use of white color background in an application for senior citizen users should be avoided. Thus, [22] stated orange or bright gray is the most suitable background color, meanwhile black and white is suitable for text color for the interface of the application for senior citizen users.

In addition, graphical content should be large and clear. Study by [18] stated that the use of relevant graphics is more significant than the use of detailed decorations. To facilitate the reading, the interface should only display the important content and remove irrelevant content from the application [10]. According to [9] the less function in the mobile application, will help the senior citizens in remembering the content and make navigation easy.

Study from [23], stated that the standard button size for an application for senior citizens should be 19.05 mm^2 . The study also mentioned it is important to have space between the buttons. For the senior citizens who have poor hand movement control, the size recommended is 16.51 mm^2 and the spacing between buttons 3.17 to 6.35 mm. However, for the senior citizens who have weak hands, the proposed button size is 19.05 mm^2 and the spacing between the buttons is 6.35 to 12.7 mm. There is also a study by [9] state that senior citizens require the good size and spacing between the buttons to ensure they are pushing the right buttons. Small designed button will cause senior citizens press the wrong button. He also added that the buttons should give the tactile feedback when pressed as a sign that the button is successfully being

pressed. Besides, every button in the application for senior citizens should have text label. [25] Mention that text label will help senior citizens a lot because senior citizens want to be confident what the result of the action, before they click on the button.

2.3. Usability

From International Organization for Standard (ISO) Standard 9241-11 (1998), usability means the product can be used by the target users to achieve the specified goals with three measurement which is, effectiveness, efficiency and satisfaction [26]. These usability components can be evaluated and measured (either formally or informally) by means of indirect measures. Effectiveness is related to accuracy and completeness with which users can complete tasks. It includes how easy the users make errors while using the application. Efficiency is related to the speed which users can complete the tasks. Satisfaction refers to the whether the user feel comfort to use the application and acceptability of use [27].

3. METHOD

This study conducts two phases of study which are User Requirement of UI features based on current mobile applications; and Usability Evaluation based on proposed mobile application.

3.1. User Requirement of UI features based on current mobile applications

From findings from literature review, there are three features identified as features for reading: Text, Color and Graphical Content. To gather current usage of those features, an interview is conducted to get more evidence on empirical study. According to [28] conducting interview is time consuming because usually it was conducted one-to-one basis and requires careful planning. However, [29] and [30], mentioned that the most desirable method of doing research with senior citizens is by using the interview method. They believe this method help much to strengthen the ideas and gathering the unstructured data. The researcher tests the current application, which is iQuranLite to Nine (9) people of senior citizens, which consist of five (5) female, and four (4) male in Manjung. The interview session was conducted to identify the issues that senior citizens faced when using the current application and to get the requirement to design the interface of the proposed application according to senior citizen needs. The result of this phase is discussed in section 4.1 and result from the interview is used to develop a mobile application and later use to measure usability of the features. The method of usability study and proposed mobile application discuss in section 3.2.

3.2. The Proposed mobile application and Usability Evaluation Phase

In second phase, the researcher starts to design and sketch the storyboard of the proposed application. The researcher designs and develop an application based on findings from the literature review and interview that have been conducted earlier. Figure 1 shows the design of the proposed application.



Figure 1. Proposed User Interface Design based on Text, Color and Content Representation Features

Next is usability evaluation phase. In this phase, the researcher tests the proposed application to the senior citizens. Nine (9) people of senior citizens, which consist of five (5) female and four (4) male in Manjung, Perak were participated during this phase. The participant’s age is from 60 to 73 years old, which were baby boomers’ generation and had been recognize as active group that use smartphone in their daily lives [4].

Firstly, the researchers set an appointment to meet the senior citizens in their home. The study was conducted at home because to maintain the natural environment so that the senior citizens will feel

comfortable with the testing session. The researcher starts the test by introductory session. The researcher introduced the senior citizens about the application and the purpose of using the application. Besides, the researcher explains the purpose of conducting the study and how the study will be conducted.

Next, the researcher tests the proposed application to the participants to evaluate the usability of the proposed application. The researcher just observes the participant while they are using the applications without guiding the participants. After finishing the testing, questionnaires were distributed to the senior citizens.

4. RESULT AND ANALYSIS

The results of the study were reported based on the following categories.

4.1. Result from Interview

This study considers the following features identified in requirement phase, which is text used, choice of color used, and the graphical content used while designing mobile applications to ensure high acceptance level among senior citizens.

4.1.1 Text

According to gerontology study, senior citizens are suffering from vision impairment especially when reading the small size of text. In order to complement their sensory disability, the participants suggested for the proposed application, the researcher should use black and bigger size of text. This statement is supported by the study from [20]. He mentioned static and black text is suitable for senior citizens users for reading. The guideline from [18] which stated a suitable font for the senior citizen users are sans-serif fonts in size between 12-14 points, short line and left justified text cannot be applied to the proposed application because font used in the proposed application is Arabic and the suitable size for the text is 40 points.

4.1.2 Color

Mobile application interfaces for senior citizens should in general contain colored text and colored graphics specifically to display the relevant information. As stated by the participants, they suggested for the proposed application, the researcher should use soft color because the colors make them happy to use the application. This statement was supported by a study [10] which mentioned soft colors should be used in the application for senior citizens. Meanwhile, study from [22] suggested the most suitable color for the application for senior citizens is orange or bright gray.

4.1.3 Graphical

Graphical content should be large and clear when designing application for senior citizen users. There are a few requirements from the participants. The participants (mentioned for the proposed application, the researcher should use larger graphic, buttons and icons so that the senior citizens can click it without any error. Study by [23], stated the button size for the senior citizens user is not the same as the standard size buttons for normal people. The senior citizens admit that large button is utterly important to any application that they would use [24]. [9] added that senior citizens require the good size and spacing between the buttons to ensure they are pushing the right buttons. Small designed button will cause senior citizens press the wrong button. He also added that the buttons should give the tactile feedback when pressed as a sign that the button is successfully being pressed. Besides, the participants request the proposed application should be designed in a simple layout yet attractive and they also mentioned to remove the unnecessary function because too many functions will make seniors confusing. In the current application, the participants stated that they only want to read the content of the surah. They don't want the unnecessary function for them such as "searching surah" icon, "quranic supplication icon" and "bookmark icon". There is a study by [10] states in order to facilitate the reading, the interface should only display the important content [10].

4.1.4 Others

The participants in the study is seen as proudly trying to keep the Bahasa Melayu as the dominant language even in the mobile application. Most of the participants insists to use Bahasa Melayu in the proposed application. Despite of many applications in the market uses English as the medium language, the participants still prefers to use mobile application that use their native language.

4.2. Usability Evaluation Analysis

During usability evaluation phase, the researcher conducted a usability testing to the senior citizens. After finishing the testing, questionnaire was distributed to the senior citizens. The questionnaire has three categories to be evaluated, which is effectiveness, efficiency and satisfaction. Based on data gathered from the usability evaluation, it can be concluded that development of proposed Mobile Al-Quran has gained positive feedback from all participants. Most of the participants have rated the usability of the application with strongly agree. Result from each question prove that the application is satisfactory and usable for the users.

5. CONCLUSION AND RECOMMENDATION

This study has identified several issues need to be considered when designing the new Al-Quran application. The requirement for mobile Al-Quran application needed by senior citizens and succeed to develop a mobile Al-Quran application that is tailored to senior citizens need and their abilities. In this research, the researcher only focused on the user interface of the needed by senior citizens for an Al-Quran Mobile application. In the future, the same research interest researcher, can explore also the audio and navigating in the interface by audio commands. The prototype could be extended to meet the needs of senior citizens that having the problem such as Parkinson and Alzheimer disease.

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