

## Usability evaluation of a mobile health application by older adults in Thailand

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### ABSTRACT

As the world's population is aging, research on older adults and their use of IT is becoming more important. Usability issues were found one of the main problems hindering older adults from using IT, including mobile health application. This study aims to understand older adults' behavior and to identify barriers and enablers for using a mobile health application, called Raksa. Two theories, namely Usability and Accessibility were adopted as a conceptual framework. A think-aloud protocol, a system usability scale (SUS), and in-depth interviews were utilized. ISO 9241-11 guide was used for identifying usability performance level of Raksa application based on think-aloud approach. Task incompleteness rate, error rate and time on task were calculated to assess effectiveness and efficiency. Interviews were conducted for validating reason of use and comment on the application design, using Nielsen's 5 quality components namely, Learnability, Efficiency, Memorability, Error and Satisfaction. The results showed that the task to find a medical specialist for a consultation was deemed the most difficult by the participants as it has the lowest task completed rates and the longest times on task. The task to create account and register had the most errors. The average satisfaction (SUS score) was 31.50, indicating poor system usability. Demographic data showed males were more successful in task completion. Educational level were related to task performance, and older adults with more experienced in information technology or social media achieved higher performance rate. This research identified usability problems and barriers that may affect usability in older adults, including visual design, poor interaction and navigation, user interface difficulty to understanding. Recommendations for design modifications were offered.

*Keywords:* Usability evaluation, mobile health application, system usability scale (SUS), older adults..

### INTRODUCTION

The COVID-19 pandemic has increased the use of telemedicine applications (Aldekhyyel *et al.*, 2021). Telemedicine system has the potential to improve the quality of life for many populations. As the world's population is aging, research on older adults and their use of information technologies is becoming more important. However, the adoption and continued use of mobile health application among older adults is low. There are usability issues that often hinder older adults from using information technologies. One of the main reasons is that most of healthcare mobile applications in the market do not carefully take into account the needs, preferences and individual ability of elderly people, resulting in usage difficulties and thus low usage number. Besides, older adults tend to face additional challenges, compared to younger people, in using Healthcare mobile applications (Charness & Boot, 2009), due to both the limitations of motion-sensing and intellectual abilities (McAlister & Schmitter-Edgecombe, 2013).

The problem in healthcare mobile application usage among older adults can still be seen continuously (Somjai, 2021). As mentioned earlier, a lack of skills and knowledge to use digital technology makes it difficult for older adults to access and use such an application, despite its benefits. However, given the higher number and percentage of older adult populations, older adults will soon be a major group of healthcare mobile application users. Therefore, healthcare mobile application should be evaluated and redesigned from the perspective of older adults so that it is more user-friendly to them.

Literature on Human-Computer Interaction (HCI) has found several factors influencing IT adoption by older adults, including usability and easy-to-navigate user interface (Lee and Coughlin, 2015). Nowadays, applications designs are complex which makes it even more challenging to use by elders due to various limitations, for instance, motion-sensing and intellectual abilities. Therefore, an application must be properly designed for older people. And in order to ensure that they are able to use it, there must be an assessment to identify obstacles that limits its use, and to improve them accordingly.

This study, thus, set to understand the reasons that the older adults do not use a mobile healthcare application and identify barriers and facilitating factors for the use of the mobile healthcare application.

### LITERATURE REVIEW

#### Older adults and their use of m-health application

Mobile health application is a healthcare system where mobile devices are used to facilitate healthcare and medical management. The system is useful especially for patients in remote area. Regardless of its benefits, m-health systems have

been slowly adopted; some are discontinued. The reasons are usability problem, such as inefficient system design, lack of ease of use, accessibility problem, inconsistencies between system features and user needs and between expectations and characteristics (Jimison et al., 2008; Or & Karsh, 2009).

At present, older adults' adoption of mobile devices is higher; however m-health application is rarely mentioned and used (Bender et al., 2014). Older adults usually have problems with technology adoption due to their age and IT skills (Ractham et al. 2022). Therefore, it is necessary to study the problem to ensure that older adults can use the health application effectively. Younger users seem to be positive with the adoption of medical-related products/services (Kaewkitipong, et al. 2022). However, older adults may have different and specific concerns on the adoption, as they have limitations in their perception of movement and cognitive skills that may affect application usability (Czaja, Boot, Charness, & Rogers, 2019). Application that is properly designed with consideration on the needs and limitations of elders may solve the aforementioned issues. For elderly population to be able to use m-health application effectively, the application must be suitable for the characteristics of the elderly users.

Prior studies, which assessed usability of mobile application for older adults, have highlighted issues that may limit the usability of the aging population. The majority of usability problems for older adults include small fonts and screens (Gao et al., 2017), inappropriate use of colors (Kamana, 2016), unclear instructions (Grindrod et al., 2014), too many functions (Isaković et al., 2016), and too many unnecessary steps within an application (Cornet et al., 2017). In general, these problems occurred because physical limitations of older adults were not taken into consideration when an application was designed. Older adults usually have problem comprehending and navigating difficult-to-use and complex applications; besides they have declining short term memory, resulting in confusion when using an application is complex and involves many usage steps (Mitzner et al., 2013). The design of the application that is inappropriate or does not support the needs of the elderly affects the ease of access and use. However, ease of use has been widely acknowledged as a key success factor for IT, including mobile applications not just in the context of healthcare (Iyanna et al. 2022). Therefore, usability assessment is important as it will allow an understanding of user's behaviours, attitudes and opinions from system usage and reveal problems and barriers that limit usability and bring the findings to improve accordingly.

### Usability Evaluation Framework

Usability testing is based on Human-Computer Interaction (HCI) literature. Usability indicates the success that a user achieve compared with his or her goals while using an application or a system. In other words, an application or a system with high usability offers good user experiences and enables its users to achieve their tasks. ISO 9241-11 defines a standard to measure usability during user interaction with a system. The standard includes metrics for effectiveness, efficiency and satisfaction (Quesenbery, 2003). According to Quesenbery (2003), Effectiveness concerns rate of task completion, error, and additional assistance that users may seek. Efficiency focuses on the quantity of resources required to complete a task; if a lot of efforts and resources are required in order to use an application to complete a task, the application is considered inefficiency. Satisfaction involves positive attitudes of users towards the use of an application or system. Similar to ISO 9241-11, a usability expert, Jakob Nielsen (1993), describes usability as a feature used to assess the ease of use of a user interface. It also means a way to improve usability during the system design process. Nielsen has defined five qualitative elements for usability, including learnability, efficiency, memorability, error, and satisfaction. Table 1 compares the dimensions of usability from the two sources.

Table 1: Comparison of usability dimensions

ISO 9241-11 (Quesenbery, 2003)	Nielsen (1993)
Efficiency	Efficiency
	Learnability
Effectiveness	Memorability
	Errors/Safety
Satisfaction	Satisfaction

An early usability evaluation is essential to guide the development of the design process in the direction of universal access right from the start. It is also an important step in user-centric design. This assessment should occur at every stage in the system lifecycle. Evaluating user interface features can anticipate and explain usability and accessibility issues, which can be performed before the system is used. The objective of evaluation is not only to address user interface issues, but also should have an ultimate objective, which is to achieve product design that meets system usage goal which can enable users to achieve their goals of use and satisfaction with the product (Karat, 1997).

The results of all assessments should visualize how easily the user can operate. There are two most common methods. 1) Usability Inspection, which is an assessment performed by experts. 2) Usability testing which is an assessment that requires a representative of the users to participate in the test. Testing by users is the most important and helpful guide. This is because it provide information about how real users are using user interface and clearly shows issues the users encounters during the interactions (Nielsen & Mack, 1994). Generally, user testing is done using the Think Aloud protocol. Questionnaires or interviews are also useful and simple assessment methods for collecting information about user satisfaction or satisfaction with the user interface (Rogers et al., 2011; Rubin, 2008).

### Evaluation of usability of healthcare and telemedicine applications

Hong *et al.* (2014) studied usability and acceptance of iCanFit, which was an application designed for promoting exercises among older adults. Thirty three older adults were recruited to use the application. Creating a user account was found the most difficult task for the participants in this study as it was the task that took the longest time to complete. However, approximately 56% of the participants were happy with the application in general and mentioned that they would recommend the application to their friends and family.

Lilholt *et al.* (2014) tested usability and gathered suggestions concerning usage and satisfaction with the Telekit, a telemedicine system for patients diagnosed with chronic obstructive pulmonary disease (COPD). The think-aloud method was applied; 6 patients were asked to use and think out loud while using the Telekit system. The authors found that the participants were more interested in the usability in terms of whether or not the system could help them achieve what they have to do rather than whether the user interface was designed nicely and allowed ease of use or not.

Constantinescu *et al.* (2018) conducted usability testing of a mobile health application for in-home swallowing therapy. Efficiency, Effectiveness and satisfaction with the system were measured. The research showed that despite self assessing themselves as highly skillful in using IT applications, some participants needed more time to get used to the application. Some tried to swipe to the next screen, though the current screen was the last one.

Georgsson & Stagers (2015) applied ISO 9241-11 and the System Usability Scale (SUS) questionnaire to assess usability of the Care4Life application, a mobile healthcare application for patients diagnosed with diabetes. It was found that editing Glucose value and exporting the Glucose value into pdf format were the most difficult task, involving highest error rate and taking the longest time to complete. In addition, gender was found related to effectiveness. From the usability testing, male participants in the study completed the given tasks more than female did. In addition, younger participants achieved higher efficiency score than the older did. Education background did not seem to affect the efficiency; on the other hand participants with more experiences with IT achieved higher efficiency score than those with less experiences did.

Or & Tao (2012) attempted to evaluate user interfaces of a computer-based self-Management system for older adults with chronic disease. Fifty participants were recruited to test a paper prototype of the system, using the think-aloud method. System navigation, information search within the application, information interpretation, and information presentation and readability were found to be major usability problems. The authors recommended that usability test should be conducted especially during the system development process to help increase system effectiveness.

Pointing to a lack of design guidelines specific for mobile application for older adults, Morey *et al.* (2019) evaluated the usability of three mobile health-related applications, using cognitive walkthroughs, heuristic analysis, and user testing. Poor navigation system, small sizes of interfaces (e.g. buttons and icons), color choices (no clear different between background and foreground), and inadequate data visualizations were found major problems obstructing the use of the older adults in this study.

Mehra *et al.* (2019) conducted a usability study of a tablet-based application designed for supporting older adults to exercise at home. Similar to other usability study, the researchers applied a think-aloud approach, asking the participants aged 69 to 99 to try using the app to complete a series of given tasks and verbalizing their thoughts. Efficiency was assessed by the amount of time the participants spent on completing a given task. Satisfaction was also assessed. Overall, the participants were satisfied with the application and able to complete the given tasks. However, the authors pointed out that factors affecting long-term usability or continuance use could be different and required a follow-up study.

Isaković *et al.* (2016) tested the DeStress Assistant (DeSA) application to evaluate its usability for elderly users. The study highlighted the need to involve the older adult users in the application design and development phases as this group of users appeared to have specific needs, including visibility problem and reluctance to IT use. In addition, as the older adults would be a majority group of users of mobile health applications, the usability testing with older adults would allow the developers to improve an application's interface that supports the older adults' needs better.

Panagopoulos *et al.* (2019) conducted a usability assessment of a homecare application for older adults. Thirty older adults were recruited to participate in the two-step usability test session. The usability test in this study showed that despite experiences in using mobile application and positive attitudes towards IT application, the older adults found the application difficult to use. The study confirmed the needs to involve older adults in the design and development phases, highlighted by Isaković *et al.* (2016). It showed that by redesign user interfaces of the homecare application according to the older adults' suggestions, the application had achieved the higher system usability score, associating with higher user satisfaction.

Tang *et al.* (2016) applied heuristic evaluation to test usability of a digital emergency medical services system. The authors highlighted that usability should be set high priority for the development of a telemedicine system and that heuristic evaluation is an effective usability testing method.

Ryu *et al.* (2020) studied user experiences of neurosurgical care telemedicine system during COVID-19 period. Increase convenience for patients was perceived as a major benefit of the system, while an inability to perform a neurological

examination via the telemedicine system was a major barrier. However, the authors argued that the use of telemedicine was likely to continue after COVID-19 as an adjunct tool for patient care.

Similar to Ryu *et al.* (2020), Aldekhyyel *et al.* (2021) had also evidenced an upward trend of telemedicine adoption during COVID-19 pandemic. The authors evaluated the usability of telemedicine applications used in Saudi Arabia during the pandemic and highlighted the need for user instructions as well as help and documentation. In addition, as users may have different experience and IT background, adding flexibility to the system, for example by allowing users to create shortcuts or customize user interfaces, may help create a more positive user experience.

Referring to the need to limit the use of hospital resources during COVID-19, Costagliola *et al.* (2021) pointed out that an improvement of telehealth or mobile health applications in terms of usability are important. Attempting to provide guidelines on improving usability of the applications, Costagliola *et al.* (2021) conducted usability testing of a mobile health application called YouCare. The usability testing, however, was conducted with young users who are experienced in the use of smartphones and achieved a good System Usability score. The authors noted that a less experienced user may find the application more difficult to use.

Choemprayong *et al.* (2021) also conducted a usability evaluation of a mobile telemedicine application, called MEDIC, which was used for orthopedic specialists to provide consultations with physicians. The authors summarized that MEDIC appeared to be quite satisfactory, although errors in data input, action failures, and misinterpretation of data were reported as most critical issues during the usability test. A limited screen size and resolution of a mobile device was reported as a cause of poor usability.

From the above reviewed literature, most studies were conducted with applications or systems that were specific for one disease or symptom. Besides, most users were patients. However, we have not seen prior studies that focused on mobile health application that was designed for generic and primary consultation and support for those who may not yet fall ill. For a more generic application, usability design may be different. This study, thus, attempts to conduct a usability testing on a mobile health application, which is not specific to one disease and see if there might be different usability issues.

## RESEARCH METHOD

This research applied a mixed method approach to examine usability of Raksas application. A usability testing of a mobile healthcare application was conducted using a Think-Aloud method followed by in-depth interview. A questionnaire was also administered after usability test to gain insights into behaviour and thought process and attitudes of participants. A mobile healthcare application, called RAKSA, was chosen in this study as it was one of the most popular and the most complete (in terms of functionalities) mobile healthcare application in Thailand.

### Participants

As the usability testing is best to be conducted with face-to-face explanation from a researcher at the beginning of the session, and the researcher needs to observe and record what a user thought while using the application. Participants aged 60 years and over were, therefore, selected based on their convenience and permission. Snowball technique was also applied in order to reach 20 older adults who were able to participate in trying and testing the RAKSA application. All participants have been using mobile devices but not mobile healthcare application before participating in the usability testing session. However, 10 of them had some basic skills and familiarities with mobile devices, smartphone application or actively used social media, while the other 10 participants had no IT background and were not a heavy mobile user. The differences in terms of background of participants were intended so that it may allow for comparison between the two groups.

### Procedures

Demographic information were collected first, then participants were introduced to RAKSA application and its basic usage. Think-Aloud Method and research steps were explained to participants individually and face-to-face. The participants were then asked to complete five assigned tasks (Table 2) with RAKSA application. They were specifically instructed to speak their choices and thoughts out loud, while using the application to complete each task. The tasks were chosen from the main features of the app, with varying levels of difficulty. The researcher simulated a scenario for participants to imagine along and interact with application according to the situation; meanwhile the researcher would observe users' behaviour, record errors that participants made, and collected length of time made by participants during work. After the participant had completed the assigned tasks, they were required to complete a Post-Test Questionnaire, employing System Usability Scale (SUS) (Georgsson & Stagers, 2015), to assess their satisfaction after use (see Appendix A). Lastly, participants were interviewed, employing a semi-structured set of questions, about their attitudes, reasons for not using the application yet, difficulties/challenges they faced while using the application, facilities and guidelines for improving the application. All tests were recorded in writing and in video format.

Table 2: Five tasks that each participant need to complete while using RAKSA application.

Tasks	Target
1	Register to the application for user account
2	Find articles about an illness
3	Find a specialist doctor for consultation
4	Edit user's profile
5	Find and try to order medicines

### Data Analysis

Data analysis was divided into two parts: 1) an analysis of usability testing data from the Think-Aloud method and from the SUS questionnaire and 2) an analysis of in-depth interview data.

#### *An analysis of usability testing data*

For an analysis of usability testing data, usability dimensions defined by ISO 9241-11 (Bevan, 2009) were adopted to assess usability of the application. According to Bevan (2009), there are 3 dimensions of usability. Each dimension can be measured as follows:

- Effectiveness - measured by the level of completion of a task and the total number of errors that occur while attempting each task. The task completion levels are 1) completed easily where the test participant was able to work on their own, 2) completed with difficulty where the test participants encountered obstacles or sought advice from the researcher; and 3) failed to complete the task where the test participant is unable to complete a task or requests to cancel during the test. Errors were counted when the test participant was unable to fix and complete the task, both intentionally and unintentionally. The more errors there were, the less effectiveness the application was.
- Efficiency - measured by the amount of time a participant took to complete each task, which was calculated from the time from the start to finish.
- User satisfaction - measured by a System Satisfaction Questionnaire (SUS) score, developed by John Brooke (1995). The SUS consisted of 10 usability questions, using a likert scale of 1-5. The SUS scores were then calculated in accordance with Brooke's guidelines. The score were calculated into percentile format, which indicates the degree of satisfaction with the application compared to the average benchmark score. If the score was greater than or equal to the standard mean score, or 68, it means an application achieved an average or a pass satisfaction score (Bangor et al. 2009; Brooke, 1995; Lewis & Sauro, 2011).

#### *An analysis of in-depth interview data*

Data from in-depth interviews together with observations of user behavior during usability test were interpreted based on Jakob Nielsen's definition of usability concept. Five elements of usability, defined by Nielsen (1995) included 1) Learnability 2) Efficiency 3) Memorability 4) Error and 5) Satisfaction. The analysis was to understand 1) why participants were satisfied or unsatisfied with the application, 2) what were the problematic steps within the app (if any) and why did they think the steps was problematic (difficult to use), 3) what should be redesigned to make the app easier to use.

## FINDINGS

### Participant Demographics

Grouped by Gender, participants comprises 7 males and 13 females aged 60-72 years. An average age of the participants was 63.15 years. Thirty five percent of the participants graduated at the elementary school level. Approximately 30% of the participants graduated at the Secondary school level, while the rest (35%) achieved bachelor's degree or higher.

### Results from usability testing

Results from usability testing of RAKSA application by the twenty older adults participating in this study are discussed in 3 dimensions, including effectiveness, efficiency and satisfaction.

#### *Effectiveness*

Task 3 (Find a specialist doctor for consultation) appeared to be the hardest task to complete. From the test, it was found that 40% of the participants failed to completed the task. The second hardest task, which has second highest failure rate was Task 1 (Register to the application for user account) and Task 4 (Edit user's profile) with an exactly same failure rate at 20%. Task 2 (Find articles about an illness) and Task 5 (Find and try to order medicine) appeared to be the easiest task, with a job failure rate of 5%.

The error rate was also calculated to indicate the difficulty, facing by the participants, in performing the five tasks. The results showed that Task 1 (Register to the application for user account) has the highest error rate at 80 percent. The most common errors are: 1) Press the arrow to select the date of birth in wrong direction 2) press the letters that says birthday which they could not. 3) Press the letters that says confirm the phone number which they could not do and 4) fill in the last name in the box for real name and press letters that says fill in personal information, which they could not. The task which had the second highest error rate was Task 3 (Find a specialist doctor for consultation). It was found that the error occurred at a rate of 75%. The most common errors were 1) Press the selection tab instead of scrolling to specify the period of illness. 2) Press letters or word that says How long have you had this symptom, which they could not and 3) Did not choose specialist doctor as specified.

Task 2 (Find articles about an illness ) had the lowest error rate of 20 percent. Table 3 shows details of effectiveness testing results

Table 3: Effectiveness in terms of success and failure rate

Task	Perform without error n (%)	Need assistance n (%)	Failed to complete task or perform with error n (%)
Task 1: Register to the application for user account	11 (55%)	5 (25%)	4 (20%)
Task 2: Find articles about an illness	19 (95%)	0 (0%)	1 (5%)
Task 3: Find a specialist doctor for consultation	10 (50%)	2 (10%)	8 (40%)
Task 4: Edit user's profile	12 (60%)	4 (20%)	4 (20%)
Task 5: Find and try to order medicine	16 (80%)	3 (15%)	1 (5%)

### Efficiency

The average work duration per person was 22 minutes 55 seconds, ranging between 11–39 minutes. Task 3 was the task that took the longest time to finish. This is coherent with the effectiveness testing result, which showed that Task 3 had the highest error rate. Task 2 (Find articles about an illness) was the least time-consuming task. Besides, according to the effectiveness result, it also had the lowest error rate.

Table 4: Average time spent to complete each task

Time per task (mins)	Task 1	Task 2	Task 3	Task 4	Task 5
Mean (SD)	6.10 (2.92)	2.25 (1.16)	6.20 (4.12)	3.90 (1.33)	4.10 (2.15)
Range	2 - 12	1 - 6	1 - 19	2 - 6	1 - 9

### Satisfaction

The average satisfaction score was 31.50, which was lower than the expected benchmark of 68. In other words, satisfaction score of the application ranked by the participants was in 'not acceptable' range of the SUS (see Figure 1). This indicates that the older adults were not satisfied with the application.

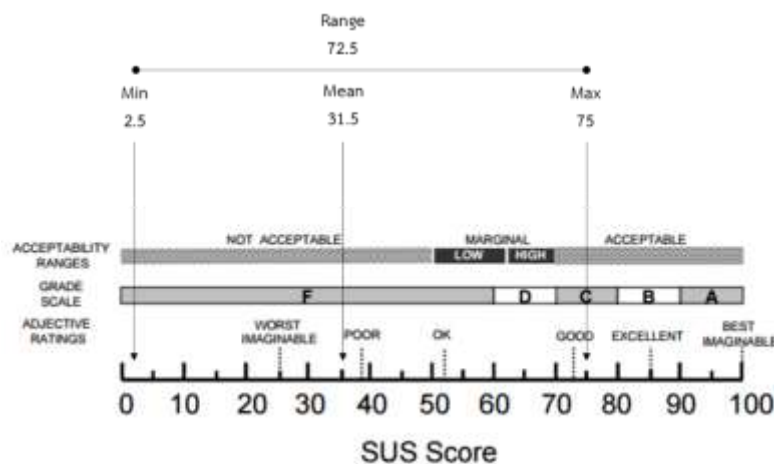


Figure 1: Satisfaction score rated by the participants on the system usability scale

Next subsection, interpretation from the think-aloud records and in-depth interviews is presented to elaborate the reasons the older adults found the application unsatisfactory.

### Usability Issues Identified from the Think-Aloud session and In-depth interviews

#### Why have the older adults not used the application?

80% of the participants had never heard of the application. However, although they could see the potential benefits of the application, they showed no interest in adopting and using it in the future as they have found that the application was too difficult and too complex for them. Some of the participants perceived their educational background, IT skill, memory, and eyesight as barriers to the use of the application.

### ***Learnability***

The participants found that the application was difficult to use, complex, involving many steps, and confusing. Besides, some of them were unfamiliar with navigating the application by themselves and required assistance while trying to use the application. According to one of the participants, “The app is too difficult to understand. I would need a helper to sit next to me and tell me what to do, because this [the application] is too complex.” (Female #2)

### ***Efficiency***

The participants felt that they could finish the required tasks slowly as it took times for them to try to understand how to use and how to find things within the application. Several applications mentioned that the application should provide a set of instructions or how-to for older adults, reduce unnecessary steps in the application, and redesign buttons, menus, and wordings that could convey better “what the button or menu is for”.

### ***Memorability***

The participants found that it was difficult to memorize the basic instructions provided by the researcher. Some participants did ask for assistance during the usability testing session; however “despite the hints [provided by the researcher], I still cannot recall, and I don’t know what to do next” (Male #5).

However, most participants pointed to their own memorability due to their age instead of the complexity of the application.

### ***Error***

During the usability testing session, some participants were able to correct their mistakes, while those who could not mentioned that because they did not understand how to use the application, they were not able to locate a menu or an action required for a given task. In addition, when the application displayed an error message, most participants closed the message box right away without reading it. They, then, did not know what went wrong and were not able to solve the problem. This affected the participants’ emotion, making them frustrated and not wanting to complete a task.

### ***Satisfaction***

Satisfaction was mentioned in terms of perceived benefits. After the usability testing session, some participants were pleased with the convenience provided by the application. The application enabled them to learn about their illness and talk to a doctor without having to go to hospital. One of the participants mentioned that “it [the application] is more beneficial than I think it would be. It allows us to search and read about disease, symptoms, and cures. If we can’t meet a doctor, we can read about the illness first.” (Female #9)

### ***Factors affecting the usability perceived by the older adults***

Functionalities and attributes of the application that could facilitate or impede the use of the application by the older adults can be grouped into three dimensions.

1) Usage: a major barrier to the use of the application perceived by the older adults was the difficulty and complexity of the application. Navigation and menu should be redesigned to be more straightforward, short and simple. A wizard to briefly introduce the key features and how to start using the application would be of much help to the older adults. Besides, technical terms and English made it difficult for the users to understand and use the application.

2) Design: most of the users found that the design of icons, menus, and buttons were not designed for them. People at their age usually had eyesight problems. Thus, size of icons, buttons, menus, fonts, and symbols should be made bigger. Colors and highlights should be carefully applied; dark and solid colors were preferred to the light and pale colors. Usage of Buddhist calendar was more familiar to the older adults than the B.C. calendar; choices of calendar systems should be provided.

3) Interaction: the usability testing session has shown that the participants with different IT background perceived and interacted differently with the application. In other words, IT background, including skills, was found influencing attitudes and interaction of the older adults with the application.

## **CONCLUSION**

This research identifies major reasons the older adults have not used the mobile healthcare application. The cause is often due to the fact that the older adults have never heard of the mobile healthcare application before. Besides, they are afraid of making mistakes and found the application is too difficult to use. The interface design was another key issue mentioned by the older adults. They did not feel satisfied after the trials. Demographically, gender, age, and IT experiences were mentioned as relevant factors influencing the older adults’ attitudes towards the application.

Factors that hinder usability include visual aesthetic design factors such as font size, font color, and layout, difficulty in understanding factor. Elderly people are confused and often misinterpret the meaning of buttons or menus, causing errors during use, and interaction and navigation factors. This factor is mainly caused by too many and too complex steps.

Factors contributing to usability include ease of use. The application is easy to use, friendly, uncomplicated, few steps and meaningful will make using application easier. The use of images will greatly facilitate the elderly. In addition, processes that are consistent with daily life or referring to a doctor visit at the hospital will further enhance the understanding of the application to the next level.

However, this study uses a small sample population so the conclusions may not cover the entire population, and because it is a short-term study, the test participant did not use all of functions available which might significantly affect the overall satisfaction score after use. Another important limitation maybe in testing process. The number of errors can be misleading due to each task has different probability of error occurrence. Therefore, future research should expand to wider range of population and more diverse areas. Allow test participants some time to use to see result, to see the number of active users as well as inactive users and why. And compare the telemedicine applications available in the market today to find out if an application with less functionality is suitable for a real user.

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#### **APPENDIX A: Questions in the System Usability Scale (SUS) Questionnaire.**

1. I think I would want to use this application often
2. I found the application was made unnecessarily complex
3. I think this application is easy-to-use
4. I think I would need a technical support to be able to use this application
5. I found several functions of the application work well
6. I think functionalities within this application are not coherent
7. I think most people will be able to learn quickly and able to use the application soon after they have started
8. I think this application is difficult/complex
9. I am confident while using this application
10. I need to learn so many things before I can start using the application