AN ELDERLY-CENTERED DESIGN APPROACH FOR MOBILE CHAT APPLICATION

NAHREEN ZANNAT[1], NADIA NOWSHIN[2], MURNI MAHMUD[3]*

[123]*Kulliyyah of ICT, International Islamic University Malaysia, Gombak, Malaysia*

**Corresponding author: murni@iium.edu.my*

ABSTRACT: Connection and communication are heavily contingent on the internet and mobile apps, especially in this pandemic. With the blessings of Information and Communication Technology (ICT), the population of this digital era are highly dependent on several mobile applications. Undoubtedly, mobile apps have made our life easier and more straightforward, especially in the communication sector. There are at least hundreds of chat applications worldwide. Most of these communication platforms have been developed with many interactive and complex features designed mainly for the younger generation. However, in the perspective of Bangladesh, the older generation is unfamiliar and less comfortable with the concept and lacks the necessary digital literacy to use these advanced communication platforms. They frequently encounter difficulties in comprehending and using those applications. Thus, the authors described human-computer interaction (HCI) and briefly discussed some of the design issues from older adults' experiences in this report. Furthermore, a suitably designed chat application was proposed based on understanding the challenges faced by the elderly. With a user-centered approach, the design emphasizes simplicity and minimalism, making it easier for the elderly to communicate through mobile technology.

KEY WORDS: *Bangladeshi elderly people, Usability, Human-Computer Interaction, chat application*

1. INTRODUCTION

The expansion of ICT is shrinking the digital distances and barriers. With the blessings of innovations, 21st century is considered as the global village whereby every citizen of the world is connected to each other through telecommunication. In this context, connection and communication are always powered by the internet and mobile apps, especially in this pandemic situation.

Undoubtedly, the smartphone has become that innovative tool that has a tremendous impact on the people of this digital era. Our lives have been transformed in innumerable ways by modern technologies, especially mobile applications. From shopping groceries to banking, we are highly dependent on mobile applications. Rybaczewska and Sparks (2021) mentioned that the internet and e-commerce play such a growing role in society and the economy that the consumer behavior is changing.

However, it is assumed that older generations utilize such technology less frequently and in more constrained ways than younger generations. Although most chat applications and smartphones are designed with numerous features to be as interactive and engaging as possible, they are still very challenging for elderly people to use. Most of the time, they do not understand properly how to use a smartphone itself or the chat application to communicate with others. Most of the chat applications' designs are developed favoring generation Z or sometimes generation Y. Thus, generation X (1980's) is not much comfortable with the navigation flow and the processes.

From the perspective of elderly people, their ability to use a smartphone or applications is quite different from younger people. Mohd Hairul Nizam Md Nasir et al. (2008) suggested that if these challenges, alongside other constraints of the elderlies in using mobile applications are sorted out, the handheld device may be able to help them in many aspects, especially in fostering and sustaining human relationship. Accordingly, studies for elderly people and technologies are continually ongoing and progressing because there is a need of chat applications for elderly users. For this reason, the elderly people and their digital ability must be comprehended to build specialized chat applications, whereby developers should focus more on simplified user interfaces and essential features.

Since technology has redefined and accelerates how people work and live, it has made communication easier, which is one it’s the most significant benefits. Okeleke et al. (2021) in a recent report of GSM Association highlighted that mobile technology had contributed extensively to realizing the key priorities of Digital Bangladesh and the social and economic goals in both 2041’s Vision and the United Nations’ SDGs. The key priorities of Digital Bangladesh largely rely on mobile platforms and services. This report clearly expresses how rapidly the necessities of mobile applications are increasing in this developing country. Hence elderly people should not be left behind.

The paper aims to provide a brief overview of the complications that Bangladeshi elderly people encounter while using a mobile application. Then, this study proposes a repository solution that can minimize the struggle of communication among them. It focuses on organizing the collection of information and takes a user-centric approach to be used in the best means of designing and satisfying their needs. The proposed solution intends to make it easy for elderly people to communicate efficiently and quickly by having high usability quality, an organized interface, minimalistic design, and simple navigation flow.

2. BACKGROUND OF PROBLEM

Today, everything around us is moving digitally. There is limited space for those who remains doing works manually. Besides, there is a limited market for previous versioned mobile phones or landline phones. According to Statista (2021), with the current global population of 7.9 billion, there are around 6.4 billion mobile device users. This increasing number indicates that at least 80 percent of people around the world are now using mobiles. Since the world is becoming digitalized so rapidly, some people from other generations struggled to adapt to its pace.

One report from HelpAge Asia (2020) highlighted that there are more than 13 million Bangladeshis were 60 years old and older in 2019. That comprised roughly 8% of Bangladesh's country-wide citizens. They also estimated that the numbers may rise up to 50% to 21.9% by the next 30 years, which was equivalent to 36 million of senior citizens. This expresses that out of every five people in Bangladesh, at least one will be a senior citizen. As this report clearly indicated that the number of senior citizens keeps rising, we cannot neglect them digitally. We must think and make them a part of this digital age as well. Otherwise, the mentioned considerable part of the population will be left behind.

According to the country's contemporary environment, one of the hardships older people who use smart devices is not understanding it clearly. The most common communication platform for this generation is mobile phones, but the complex features and design are not understandable and simple enough to be used regularly. They desperately need a new and unique communication platform to be a part of the ICT era.

3. LITERATURE REVIEW

McCombes (2021) defined that a literature review analyzes the literature available on a particular subject. The review provides a broad perspective of current knowledge, helping one recognize related ideas, methodologies, and areas for further research. For this paper, the authors conducted a literature study to review any existing technology, notably communication apps that are already available on the Google Play Stores, as well as existing websites on the internet.

To develop a suggested application, it is critical to conduct some preliminary study and assessment of current systems. The authors have already specified the problem description and scope of this project in the beginning section of the report. Now, the literature review of the suggested topic is included in this section. In addition, this section of the study devoted more time to analyzing and evaluating previous similar applications. This literature review has four objectives: surveys, synthesis, analysis, and presenting the research results**.**

3.1 Usage of Chat applications

The world around us is now powered by ICT. Thousands of applications have made our communication much easier than before and many chat applications are being invented every year. However, when it comes to designing newer inventions and technologies, our senior citizens are often less prioritized. There are not enough mobile applications in the market that are specifically designed and developed for older people (García-Peñalvo et al., 2014). This statement indirectly agreed that elderly people did not get much attention in the context of digital tools.

3.1.1 Chat Application Usage Worldwide

The existing mobile phone architectures have less consideration for the needs of elderly users. New applications and devices were never more manageable for the elderly. Despite mistakes and challenges, the number of older persons using mobile phone applications is increasing due to some senior citizens being curious about new chat application platforms. Still, using chat applications might potentially be risky for seniors. Conversely, social networking seemed to be less appealing to them.

This fact may resonate with Butcher (2020) who reported that most of the new social applications are developed for youngsters. As of October 2020, WhatsApp tops the online messaging platform by having 2 billion monthly users, leaving far behind the 1.3 billion Messenger (owned by Facebook) users. Following Messenger closely behind was WeChat which was used by more than 1 billion people. Based on this statistics, older people may only be interested in applications that are widely used by their closest circle as communication means.

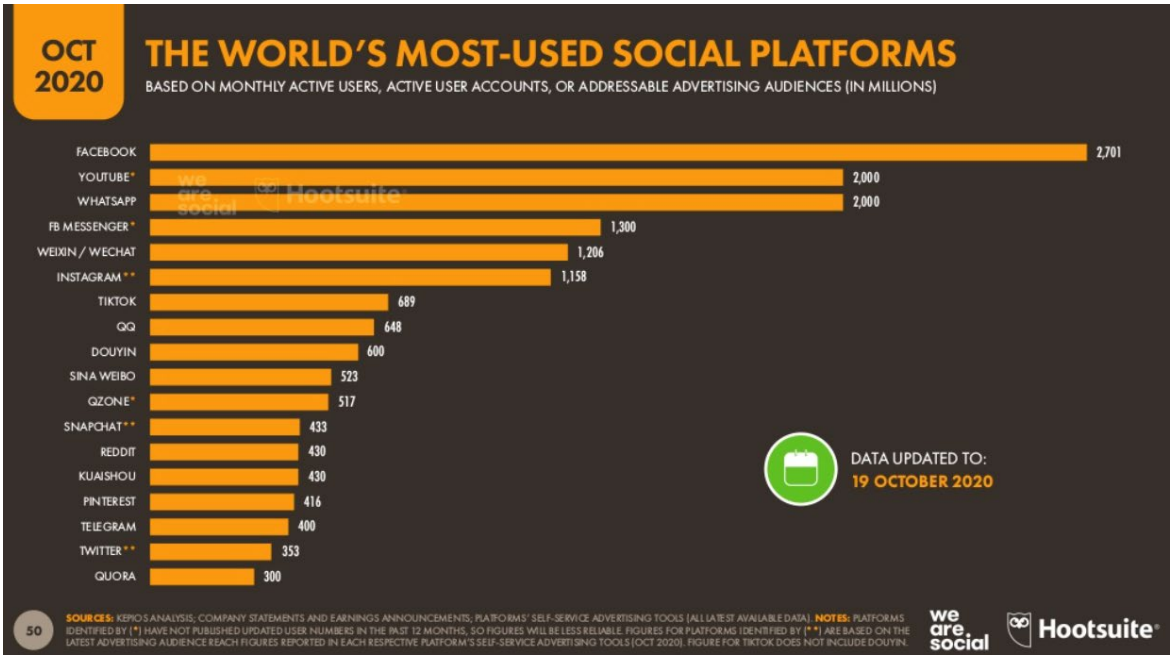

Figure 1: Statistics of chat app users worldwide. Retrieved from Butcher (2020).

3.1.2 Chat application usage in Bangladesh in the perspective of elderly

Elderly people in Bangladesh are less familiar with mobile infrastructure, which makes them face difficulties in performing the navigation process. Due to this, older adults are less motivated to use mobile applications. Besides, there are numerous updated options and features in a chat application within such a short span of time, such as – story, status, updating biography or profile, and other functions that are often not really needed by the elderlies. Upon this reason, they often have poor understanding of how the application works and may mistakenly click on buttons

that navigate differently from their intention. Ultimately, this results in them avoiding smart devices or applications.

In Bangladesh, most senior citizens ask for aid utilizing applications. A research officer of Institute Development Studies, Hernandez (2019) established that only 49% of people in Bangladesh could send and receive text messages that were fundamental for m-health services, even though they were highly SMS-based. Moreover, a study by Khatun et al. (2016) showed that, in rural Bangladesh, users had largely ignored their text messages due to an inability to read them.

3.2 Descriptive overview of similar chat applications

Table 1: Functional summary of the currently popular chat applications

App name	Description	Basic features & functions	Design Challenges
WhatsApp	WhatsApp is the most popular chat application created in 2009 by American developers. Currently has around 2000 million users from all over the world. Link: https://bit.ly/3gRHEQb	• **Home:** Display the information to log in or sign up. • **Log in -** Use phone number to log in • **Features:** I. **Chat list:** Have all the text in one place. II. **Status:** Users can upload images, video, audio, or texts as status III. **Calls:** Can make audio and video calls to anyone who has WhatsApp account IV. **Settings:** Have privacy and account settings. V. **WhatsApp Web:** Helps user to connect with desktop or laptop VI. **Authentication:** Phone number	According to Church and Oliveira (2013), users found WhatsApp settings to have too many features that were confusing. The double tick indicator of reading/seen was also often misunderstood by elderly people.

Messenger	Messenger is the second most popular chat application which Facebook developed in 2008. Currently, it has 1300 million users from all around the world. It has a vast user base located in North America. Link: https://bit.ly/3yH8SPC	• **Home:** Display the information to log in or sign up. • **Login:** Use Facebook account, email, or phone number to log in. • **Feature:** I. **Audio and video call:** Experience audio and video calls, including individual and group messages. II. **Instant text messaging:** Experience instant message transfer anywhere with an internet connection. III. **Voice text messaging:** Can make voice records and send max 1-minute duration. IV. **Image sharing:** Share pictures and videos in chats and also make a story. V. **Watch together:** Enjoy and share videos with friends and family. VI. **Settings:** Have privacy and account settings.	Bong and Chen (2015) highlighted that Facebook messenger has too many functions that elderly people were confused, especially while creating chat group. They also found it difficult to understand navigation flow.
Viber	Viber is the third most popular chat application in the world. It was created in 2010 in Japan. Most of the users are Eastern Europeans.	• **Home:** Display the information to log in or sign up. • **Log in -** Use phone number to log in • **Features** I. Chat list - Have all the text in one place. II. **Status:** Users can upload images, video , audio or texts as status III. **Calls:** Can make audio and video calls to anyone who has WhatsApp account IV. **Settings:** Have privacy and account settings. V. **WhatsApp Web:** Helps user to connect with desktop or laptop VI. **Authentication:** Phone number	Users appeared to understand Viber's use of the words "seen" and "delivered." These kinds of indicators also raised concerns about privacy. (Bong & Chen, 2015)

Telegram	Telegram is mostly popular in southeast Asian countries. It was created in 2013 by Russian developers. It has currently 500 million users.	• **Home:** Display the information to log in or sign up. • **Login:** Use email or phone number to log in. • **Features:** I. **HD video call with audio:** High quality sound and video for one-to-one or group calls, with call reaction features. II. **Smart Messaging:** Use fun stickers and mention other users with '@' III. **Screen Sharing**: Allow others to see what's on your screen throughout a call. IV. **Call recording and Live subtitles:** Record calls, take notes, and read live subtitles to catch up with what's spoken. V. **Call phones:** Call directly and affordably to mobile numbers and landlines internationally without needing an internet connection. VI. **Private conversations:** Have conversations peacefully with industry standard encryption from end to end. VII. **Authentication:** Mobile and email.	As authors already mentioned, with aging the cognitive abilities of the elderly gradually reduce, so intuitive approaches such as straightforward icons and buttons can help them understand.
IMO	"In my opinion" a chat application created in 2007, which is widely popular among Asian countries (e.g., Bangladesh, India, Pakistan etc). It has around 500 million users of android and iOS.	• **Home:** Display the information to log in or sign up. • **Login:** Use email or phone number to log in. • **Features:** I. **HD video call with audio:** High quality sound and video for one-to-one or group calls. II. **Chat list:** Have all the text at one place. III. **Calls:** Can make audio and video calls to anyone who has an IMO account, regardless they are online or not. IV. **Audio Clips:** can send audio clips instantly and pre-recorded. V. **Settings:** Have secured privacy settings.	Like other contemporary chat applications, IMO has design complications as well such as the font size issues, along with too many features which make the navigation process complicated.

Skype	Skype is the first popular video chat application invented in 2003 by Microsoft corporation. Currently it has 100 million users. Most of the users are from South America and Australia.	• **Home:** Display the information to log in or sign up. • **Login:** Use email or phone number to log in. • **Features:** I. **HD video call with audio:** High quality sound and video for one-to-one or group calls, with call reaction features. II. **Smart Messaging:** Use fun stickers and mention other users with '@' III. **Screen Sharing**: Allow others to see what's on your screen throughout a call. IV. **Call recording and Live subtitles:** Record calls, take notes, and read live subtitles to catch up with what's spoken. V. **Call phones:** Call directly and affordably to mobile numbers and landlines internationally without needing an internet connection. VI. **Private conversations:** Have conversations peacefully with industry standard encryption from end to end. VII. **Authentication:** Mobile and email	In a recent article regarding the relevant issue, Graham (2020) reported that various attempts have been made to create an easy-to-use Skype for the elderly solution. However, these have repeatedly failed because the technology involved was still too challenging for someone with a technology phobia to use.

4. ENCOUNTERED ISSUES AND COMPLICATIONS BY ELDERLY PEOPLE

This section describes the physical and digital complexities elderly users confront with user interface. The main cause of issues and complication faced by elderly is a lack of digital experience and physical capability. As described earlier, most chat applications were designed for the younger generation which were comparatively difficult for older people to understand, even in terms of the basic concept and design of that application. However, after the invention of touch screen, these difficulties had decreased. Touch screen user interfaces are becoming more popular for enhancing the digital experience of elderly people due to being able to give direct input and customize button size to be bigger, without needing extra components on the device (Jin et al., 2007). Other than that, physical capability plays a great factor in case of older adults. Some common complexities can be struggles with visuals, hearing, dexterity, reading a menu, or navigating their way around the phone, as well as communicating with friends. Caprani et al. (2012) stated that, ageing gradually deteriorate physical movements, making it difficult for the elderlies to navigate in small interface targets. Elderly who are more than 65 years old may also find difficulties clicking buttons on devices.

Table 2: Digital and physical complications faced by older adults

Types of complexities	Description
Vision declines with aging	• Pupil shrinkage cause reduction in width sight (Phiriyapokanon, 2011) • Most adults notice weakening sight by their 40s (Fisk et al., 2009) • Unfriendly colours, smaller fonts impact on usability and too many features create challenge in focusing among older adults (Fisk et al., 2009)
Miss-clicks	• Difficulties to press buttons or doing gestures properly due finger stiffness developed through ageing • Small button design, making it hard for the to distinguish different icons • Difficulties to press buttons due shaking fingers
Cognitive decline with age	• Memory loss or struggles to remember information • Difficulties in sustaining attention • Difficulties in multitasking • Cognitive decline in aging people is among their biggest obstacles in using a smart device (Czaja et al., 2006; Caprani et al., 2012; Fisk et al., 2009).
Complicated navigation flow and user interface	• Apps interface designs created in the favour of youngsters while neglecting the elderlies due to Chat apps being widely popular among young generation. • Complicated navigation flow. They often face difficulty while navigating from one application page to the next. • Lack of confidence in their skills while navigation, which worsens the situation when they found error messages after their actions (Phiriyapokanon, 2011).
Digital technology adaptation	• Lack of digital practice • Low-literate user feel uncomfortable using application interface • Difficulty while accessing the application and user friendliness. • Difficulty using scroll bar for extended information • Unnecessary functions create complexity of understanding user interface.

5. METHODOLOGY

5.1 Collection of data and analysis

This study focused on how a humanistic approach could be used in the design, development, and testing of a mobile based communication platform. This user-centered strategy was modified to increase the dependability and usefulness of the system, as well as to meet the needs of elderly people. Therefore, a person-centered approach must be implemented, and data from users must be collected, to provide a better design idea and an effective solution for the targeted consumers, particularly in the case of older users. In this study, fifteen senior people between the ages of 55 and 75 years old were interviewed regarding their life style. As a result of their similar backgrounds, such as age and user experience, the senior users may be reliably analyzed, and an acceptable solution can be developed for their specific design demands.

5.2 Methodology for Software Development

“Easy-It” is an Android application software, is developed by using Agile software development methodology, which consists of six steps as presented in Table 3. Following the gathering of user data and requirements (Phase 1), a low-fidelity prototype was constructed, and then a high-fidelity prototype was created (Phase 2) with Figma prototyping tool, which was followed by the implementation of the system using the flutter framework and the dart programming language (Phase 3). Users provided feedback on the prototype, which was used for further improvement and update it (Phase 4). With the help of this progressive method, continuation of development and evaluation further resulted in an upgraded and refined system (Phase 5). All the user participants’ suggestions, opinions, and recommendations were also gathered by the authors for the purpose of future improvement and development (Phase 6). The phases are presented in Table 3.

Table 3: Description of Agile Phases

PHASE	PURPOSE	PROPOSED STRATEGY
Phase 1: Plan	To come up with solutions for the problems the targeted users face. This breaks down software development into small units that can provide workflow.	1. Study targeted users' background in relation to the problem. 2. Engage with them and study their behaviour. 3. Review existing systems in Literature Review.
Phase 2: Design	To present a software design based on the prerequisites.	1. Sketch a software with relevant features. 2. Develop a prototype
Phase 3: Develop	To construct the actual application in specific platforms.	1. Integrate to Firebase. 2. Construct the application through a mobile application framework.
Phase 4: Test	To confirm that software fulfil the targeted users' needs.	1. Conducting a User Acceptance Test (UAT). 2. Fix the errors.
Phase 5: Release	To deliver the application to the target users.	Provide the installation link of the application to the targeted users
Phase 6: Feedback	Gather feedback from end-users and stakeholders.	Evaluate the system by getting feedback from the users.

5.3 Design thinking

In a recent article published Interaction Design Foundation (2020), design thinking is a very effective way to confront undetermined problems with a humane approach. With this approach, the problems faced by the targeted users are reframed by putting human as the center of the solution throughout the phases of brainstorming, developing, and user-testing. It also implements critical reasoning problem solving resulted by probing the challenges and ideas. It is more than a limitation of mindset and operation; it is a collection of methodologies.

In the field of ICT, designing a solution for a particular issue needs great attention and importance. According to Martinez-Martin & Costa (2021) the design of the proposed technology solutions should allow an elderly to use it in his daily routines, by keeping in mind the prerequisites for their acceptance. As a result, it's critical to accurately establish platform goals, particularly in terms of support, including the environment with which to engage. Developers and designers should focus on HCI so that it can benefit with significant potential among the target users.

For this paper, authors considered the user-centric design and development to enhance the reliability and accessibility for the older generation. For the design thinking and proposal of a solution, it is necessary to use humanistic approach when collecting data from them. From the analysis of the data, it is possible to include the essential features they preferred and drive the usability more. Quantitative data was collected from fifty elderly people from Bangladesh. Qualitative data was gathered from the same participants through interviews. As part of the design thinking process, the data was analyzed then possible solutions were derived.

Aforementioned section of this paper has the description of the issues and complexities elderly people face. While describing about the limitations elderly people face, Kobayashi et al. (2011) stated that the limiting attributes include difficulties related to seeing the display and pressing buttons correctly, as well as having a high learning curve. Therefore, authors found some solutions that can diminish the digital barriers among the older adults:

1. Larger icons and buttons: Several studies related to technologies for elderly people mentioned that larger and straightforward icons are more favourable for the elderly people as it is more visible to them. On a relevant study about this issue, Caprani et al. (2012) highlighted that, larger features not only help users with vision problems but also maximizes the accuracy of selecting features. In another study, Fezzani et al. (2010) compared the performance between youngers and older adults based on target size and found that decreasing the target size created difficulties in tapping accuracy and increased time per performance related to the task. However, it was bigger issue when faced by the elderlies due to their weakening motor abilities. Thus, it clearly justifies, that to satisfy the needs of elderly people larger icons and buttons are essential.

2. Simplified interface: Elderly people uses chat applications for basic uses such as – calling or texting. Most of the other features such as put story or status or uploading pictures are non-essential to majority of them. Phiriyapokanon (2011) stated that, too much multimedia usage creates barriers in utilizations of application. It also distracts them in navigation process.

3. Simple navigation process: Elderly people often find hardships while perform the navigation process of an application. This results in pressing the wrong button or landing on a different page. To minimize this problem, a simple navigation flow can increase the usability more and carry out the task efficiently.

4. Spacious layout: As elderly people tend to have finger shaking problem, a spacious layout can help them to differentiate among the attributes. Faisal Mohamed Yusof et al. (2014) claimed that spacious buttons help elder users to tap the target more accurately and prevent them from miss-click. Jin et al. (2007) suggested that the spacing should be set at least 12.7mm and up to 3.17mm to increase accuracy in using the application among the elderlies.

5. Eliminate non-essential features: Too many features often complicate the using process of an app for the older adults. They always need basic features and functions with a simplified design so that they can easily communicate with others.

5.4 Gathering Data from the users

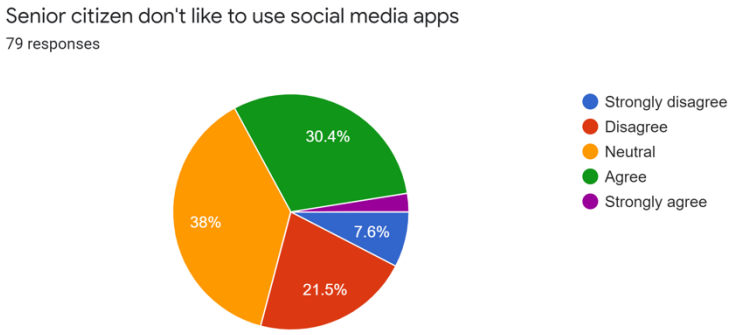

Figure 2: Opinion on social media usage of senior citizens

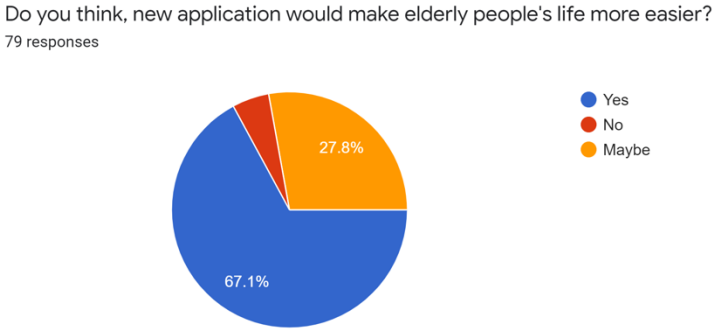

Figure 3: Perception of elderly people on learning a new application

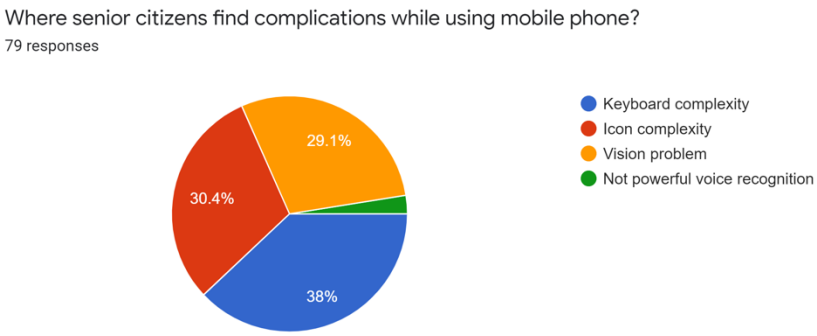

Figure 4: Difficulties encountered by Bangladeshi older adults

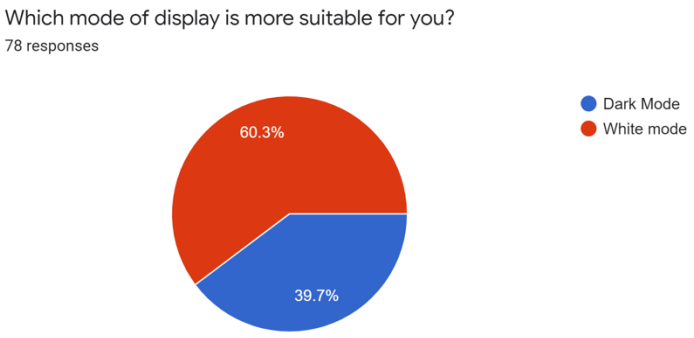

Figure 5: Essential features chosen by older adults

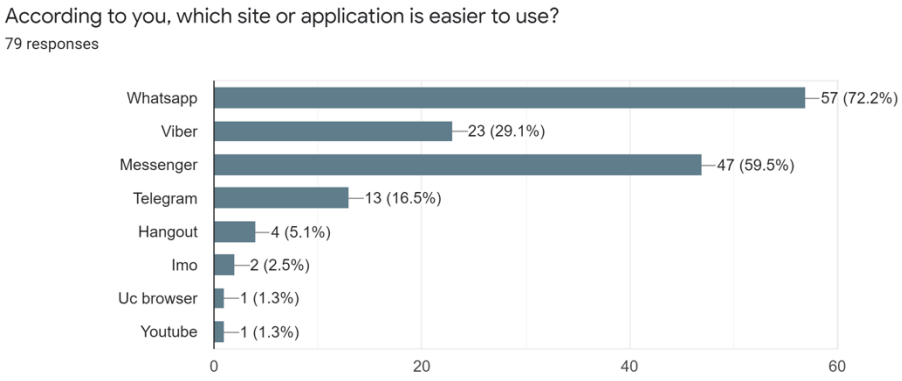

Figure 6: Easier chat app preferred by older adults

5.5 Agile Software development

In this section, authors describe about the software development methodologies. To complete this whole study, authors have approached with Agile software methodology which consists of 6 steps.

Table 4: Description of Agile phases

PHASE	PURPOSE	PROPOSED STRATEGY
Phase 1: Plan	To come up with solutions for the problems the targeted users face. This breaks down software development into small units that can provide workflow.	1. Study targeted users' background in relation to the problem. 2. Engage with them and study their behaviour. 3. Review existing systems in Literature Review.
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Phase 5: Release	To deliver the application to the target users.	Provide the installation link of the application to the targeted users
Phase 6: Feedback	Gather feedback from end-users and stakeholders.	Evaluate the system by getting feedback from the users.

6. THE SOLUTION :PROPOSED INTERACTIVE DESIGN

6.1 Physical design

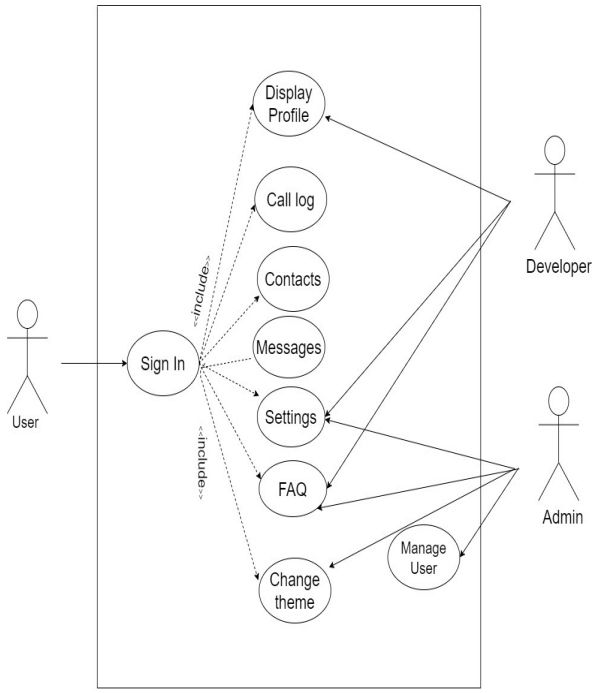

Figure 7: Use case diagram for the proposed solution

6.1.1 Use Case Table

Table 5: Use case table

Use Case Name	Description	Participating Actors and Rules
Sign in or sign up	Allows the user to sign into the account or create a new account	Users
Display home page	Displays all features and functionalities of the app. Such as- Call log, contacts	Users
Display Profile	Describes the profile of users. User can edit and update his/her profile name, phone number, about and picture anytime.	Users
Call log	Describes all the incoming and outgoing audio calls	Users
Contacts	Display all the contacts who has the app	User
Settings	Describes general settings of the application	Admin, developer, user
Messages	Describes the message sent and received.	User
FAQ	Describes all the popular questions about the app and manual	Admin, User, Developer.
(Change) Themes	Allows users to change the theme of the app dark or light mode	Admin, Users

Figure 7 represents the overall activities and explains features and functionality of the application. This use case diagram in Figure 7 explains that initially, the system asks the user if it's user's already have an account, if the answer is affirmative, it goes to the registration module, then verifies the phone number. Once done, it automatically logs the user in. If the answer was a negative for first time use, the system shows the login page. Once logged in, users can use the application features. If the user clicks on the features, the navigation flow continues.

6.1.2 Activity Diagram

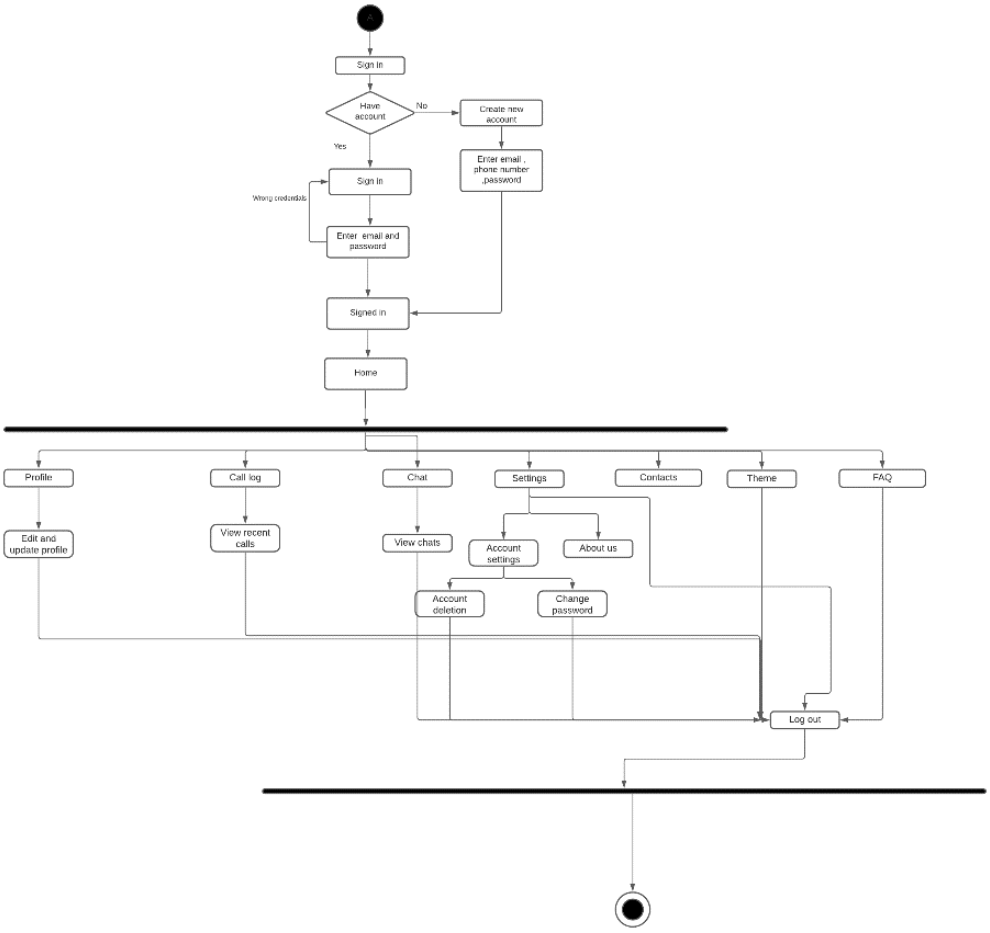

Figure 8: Activity Diagram for proposed application interface

Figure 8 represents the navigation flow of “Easy It” system. For the new users they must create an account by providing necessary credentials and existing users can login by providing phone number. Next, when signed in successfully with correct information, users land in home page and can use the features such as profile, contacts, call log, settings, themes, and FAQ. Other than these, few of the features have sub features for example change password or account deletion.

6.2 User Interface Design

As this software has particular and very specific target market, it is essential to focus more on user requirement of user experience (UX) and be careful about the user interface (UI) design. Mohd Hairul Nizam Md Nasir et al. (2008) found that those aging 60 years old and above use mobile phones for very specific objectives, including to make emergency calls or sending text messages. Additionally, Martinez-Martin & Costa (2021) mentioned that considering these objectives, the proposed technology solutions should be thoughtfully designed so that a senior citizen can fully and appropriately use them in his or her daily routine.

By these statements, it is understandable that to design and develop a mobile app for elderly needs more attention and must be satisfy their requirements. The proposed system “Easy It” was fully developed by using the Dart programming language and flutter framework as well as firebase for the user authentication and database part. It is using the android studio to accelerate the development and provide the highest quality apps. On the other hand, as for the user testing, developers build an APK version of the app to drive the user testing on their android devices.

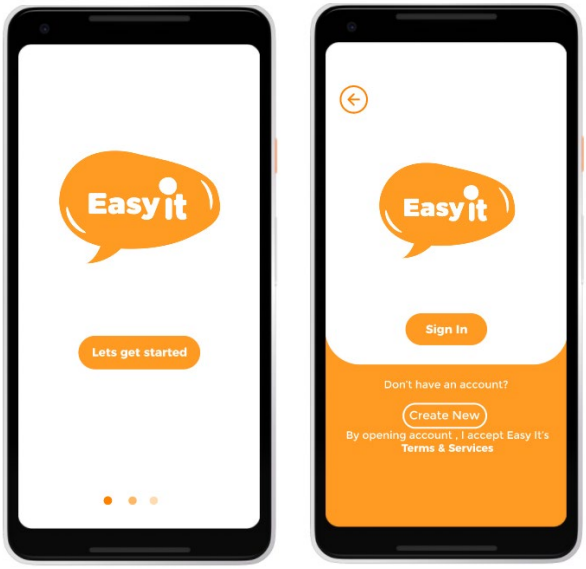

Figure 9: Splash screen and sign in page

Splash screen contains the app’s logo and after that, user lands in sign-in page.

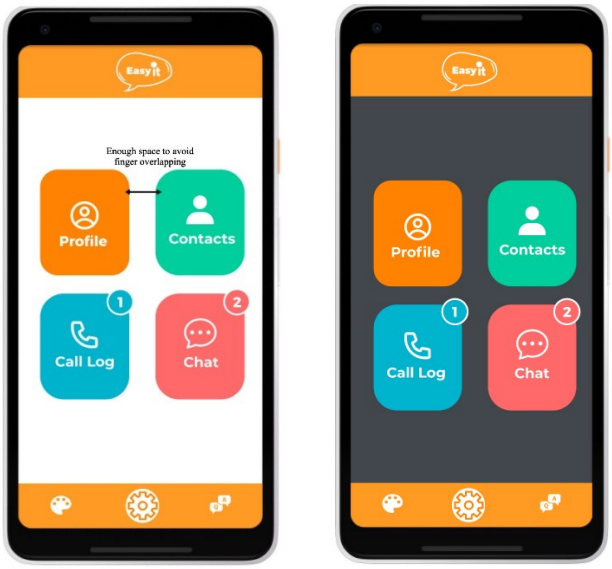

Figure 10: Spacious landing page to avoid miss click

As finger stiffness with aging is the common problem found in this study for this reason “Easy It” designed as a spacious home page with basic features along with enough space (figure -10) between them to avoid the miss click or finger overlapping.

Figure 11: Profile page in both themes

Figure 11 displays user profile page which consists of user’s name, about, and registered mobile number. In this page, users are also allowed to update and modify their credentials.

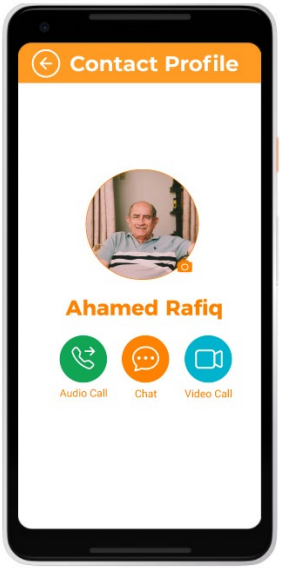

Figure 12: Contact profile

By clicking on contact, it directs user contact profile (as shown in Figure 12). All icons are straightforward and included in one interface. This design facilitates the navigation movement for account holders and reduces ambiguity.

Figure 13: Chat Page

As older people often face difficulty while reading the information or any text messages, for this reason chat page consists of a simplified view with larger icons, fonts as well as picture of the sender in the chat page (figure 13). Moreover, to make it more trouble-free, users can make call from the same chat page as well. Thus, it lessens the complications of navigation.

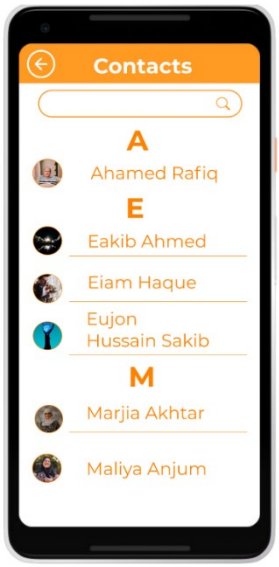

Figure 14: Contact page

Figure 14 shows that user's contact page. Older people face difficulty finding contacts to call or send message to others. In this page, contact is alphabetically ordered and used large fonts (Montserrat Regular and bold, 30) so users can easily view contact information and click on their preferred contact.

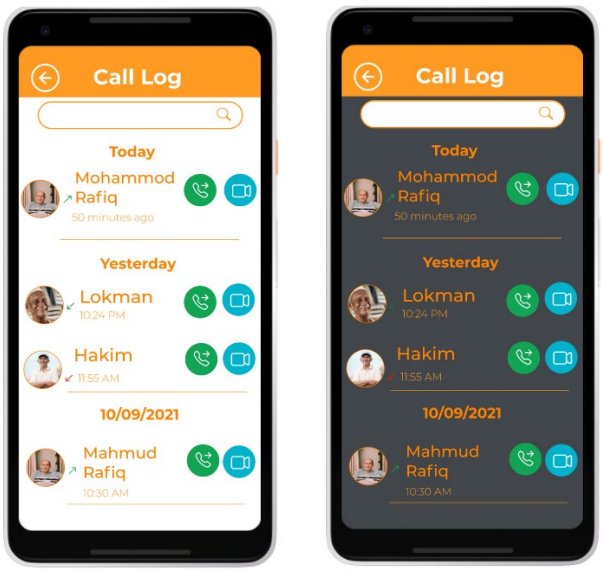

Figure 15: Call log page

Figure 15 shows the call log page of “Easy It” system which is also a minimalistic design. User can see the history of incoming and outgoing audio and video calls and make call from the same page. This diminishes the trouble of navigating repeatedly from one page to another to perform an action.

Figure 16 – Themes, settings, and FAQ in the bar.

In the bottom bar, “Easy It” has option of changing of themes, setting and FAQ. The complete has two types of themes. Dark and white mode for vision comfort.

7. RESULTS

To evaluate the system authors set up user testing processes with some target users. They consisted of four men and three women from similar background, aging between 55-65 years old. All of them had previous experience on using messenger and WhatsApp for at least 6 months. None of the users used more than two chat applications and they all fall under the same digital literacy scale. The authors mostly conducted casual observation and conversations to assess the participants throughout the session. The system is tested by the users and the test plan, outcomes and the recommendations were discussed below.

7.1 Test Plan

The method for the User Acceptance Test (UAT) is conducted using APK. The flow of the UAT is: (i) propose to the expected participants, (ii) provide the questions, (iii) explain the flow to users beforehand, (iv) let the participant navigate to the system, (v) ask the participant to use the features, (vi) calculate duration, (vii) Close the UAT, and (viii) give token of appreciation to the participant. Below is some of the result of the UAT conducted during the implementation of the system.

USER 1

Table 6: User 1 acceptance test results

User's Information	Activities	Duration	Comment
Name: Asmaul Husna **Age:** 55 years **Location:** Dhaka, Bangladesh **Date:** 02.06.2021 **Email**: znikhat610@gmail.com	Create new account	1.3 minute	Interesting design but more features needed
	Create and modified own profile	2 minutes	
	Add a contact	1.4 minutes	
	Make a call	45 seconds	
	Write and send Text	1-minute 40 seconds	

USER 2

Table 7: User 2 acceptance test results

User's Information	Activities	Duration	Comment
Name: Raihan Sadat **Age:** 56 **Location:** Khulna, Bangladesh **Date:** 05.06.2021 **Email:** raihansadat64@gmail.com	Create new account	2 minutes	Buttons are large enough which is easy to navigate.
	Create and modified own profile	3 minutes	
	Add a contact	2 minutes	
	Make a call	1 minute	
	Write and send Text	1 minute 30 seconds	

8. DISCUSSION AND CONCLUSION

Older people's use of chat applications is the subject of a study in this paper. For this study, researchers used triangulation, a combined qualitative-quantitative technique (focus group talks, online questionnaire). This research looked at things including usage patterns, issues, perceived advantages, and requested and undesired features. Based on the findings from senior citizens, they are more comfortable with simplified design and always prefer minimal navigation flow. During the study, participants suggested their design needs according to their experiences.

The method succeeded because it focused on a humanistic perspective that puts user's requirements first. Based on survey, the authors have observed that older adults are having difficulties because of colour, fonts, non-essential features, and complicated navigation process. Therefore, to make it user-friendly according to the user satisfaction authors designed the app with extra-large fonts, wider space, and vision comfort colour for the system. The Agile software development methodology is used to develop Easy Its app. Undoubtedly, a method like Agile which is very adaptable will help to respond to the changes according to the user's wants, needs, and demands as well as constantly improve application.

Besides, in Agile methodology, the decision-making process is directly influenced by user involvement, and as a result, majority of users had positive feedback and recommendations. Every phase of development was defined by clear expectations of quality. Concisely, user-centred design approach helped the authors to conduct the study properly and more interactive for the target users. However, this study was conducted during COVID-19 pandemic, thus it included very few participants. Also, there were a lack of information available due to the crisis in the region, limiting the possible number of participants who could be tested.

In the future, authors hope to conduct larger studies to investigate this issue for more enhancement of the system. Thus, having more data on how older adults prefer their mobile phone usage will allow developers to design better applications which will meet user's needs and satisfaction. The main objective of the system is to support the elderly population in accessing and navigating a chat application, can

be summarized as aiding people in an easy way. It gives older people more ways to talk and spend time with others, even when they aren't feeling well.

To conclude, even though we now live in a digital world, it is a clear picture that our older generation is still struggling to keep up with all the newer technologies. There are numerous applications available today, as well as numerous smartphone models. However, due to a lack of digital knowledge and practice, our older generation faces trouble to use these apps in most cases. They look for assistance from younger people to get comfortable with and learn new technologies. The success of this project provided them with a lot of opportunities. The digital divide they are facing now must be bridged, and everyone must recognize that a more user-friendly platform can help them become more interested in ICT.

Furthermore, it cannot be denied that technological advancements have a significant impact on our daily lives. These technological capabilities should be available to the older generation as well. These facts inspired the authors to focus through design thinking approach in the perspective of older adults and develop an assistive tool that helps them to communicate with everyone efficiently. Lastly, the key purpose is to create a more interactive and assistive application that makes it simple for the target user to converse and socialize. Most importantly, they can understand the features and navigations without the help of others. This app provided a new and unique platform for elderly people to participate in the digital age.

ACKNOWLEDGEMENT

Authors would like to thank the elderly participants from Dhaka, Bangladesh who were involved in this study. The authors would as well like to thank International Islamic University Malaysia, particularly the Kulliyyah (faculty) of Information and Communication Technology, for creating the platform for students to showcase their works. Finally, we are grateful to everyone who is directly or indirectly related and helped to complete this paper.

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