

**DESIGNING TASKS ON A
TOUCH-BASED INTERFACE
THAT WILL BE INTUITIVE FOR
OLDER USERS**

A Thesis by Osarieme Thelma Osagie-Erese

Ashesi University College
Designing Tasks on a Touch Based Interface That Will Be Intuitive
For Older Users

By
Osarieme Thelma Osagie-Erese

Dissertation submitted to the Department of Computer Science,
Ashesi University College
In partial fulfillment of the requirements for the award of Bachelor of Science
degree in Computer Science

April 2014

DECLARATION

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate’s Signature:.....

Candidate’s Name:

Date:

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by Ashesi University College.

Supervisor’s Signature:

Supervisor’s Name:.....

Date:.....



ACKNOWLEDGEMENT

Much gratitude goes to my parents, Prince & Mrs. Austine Osagie-Erese for the opportunity to be a part of the Ashesi experience.

My supervisor, Dela A. Kumahor, for his guidance and valued advice and all participants of the interviews and tests carried out.

To God Almighty, for the grace and strength He provided through this project.

ABSTRACT

This thesis discusses the difficulties older users encounter with Smartphones and tablets. It goes further to discuss the possible reasons for these difficulties and also suggests a solution in form of an application which will help to improve intuitiveness in the above mentioned devices for older users.

TABLE OF CONTENTS

DECLARATION	III
ACKNOWLEDGEMENT	IV
ABSTRACT.....	V
INTRODUCTION	1
1.1 PROBLEM STATEMENT	1
1.2 BACKGROUND	2
Sensation and Perception	4
Cognition.....	5
Motor Control	6
1.3 RESEARCH OBJECTIVES AND QUESTION	7
1.4 THEORETICAL FRAMEWORK	8
1.5 METHODOLOGY	8
1.6 SIGNIFICANCE.....	8
1.7 LIMITATIONS	9
1.8 OVERVIEW.....	9
LITERATURE REVIEW	11
METHODOLOGY	15
3.1 RESEARCH METHODOLOGY	15
3.2. PARTICIPANTS	17
DATA ANALYSIS	18
4.1 INTERVIEW RESULTS	18
4.2 EXPECTATIONS OF AN INTUITIVE APPLICATION	19
4.3 USABILITY TEST RESULTS.....	19
4.4 LIMITATIONS	21
PROPOSED SOLUTION	22
5.1 PERSONA	22
5.2 SCENARIOS	22
5.3 PROTOTYPE TESTING	24

CONCLUSION.....	26
REFERENCES.....	28
APPENDIX A.....	30
APPENDIX B.....	32
APPENDIX C.....	33
APPENDIX D.....	35

CHAPTER ONE

INTRODUCTION

1.1 PROBLEM STATEMENT

In this time where technology or the Internet has become increasingly important in our lives, it is imperative that everyone is comfortable with the tools of communication. With the exception of the people who have not had the opportunity of being around technology, we find that most people born in the nineties and afterwards are tech-savvy and have even been described as digital natives. A digital native can be defined as a person born or brought up during the age of digital technology and so familiar with computers and the Internet from an early age. On the other hand, people born before this time, although aware of the influences of technology are not very comfortable with the rate at which it changes and the stage it has gotten to. This might seem like an unimportant issue but this problem affects everyone both old and young alike. For instance, I would like to be able to *Skype* with my grandmother and find out how she's doing but due to her limited understanding of the way the device (be it a phone or a tablet) she is using works, this is not possible. Another example will be the invention of different applications i.e. travel booking apps, health apps, online purchases but to mention a few, that have been created to help make life easier but for people who have no knowledge about these things, this new and improved technology has no impact for them. Although focusing on the older adults, this is not to say that there are no young people who are just as clueless. This project focuses on ways to help the older adults to improve their

technological experiences. From previous research carried out by scholars in the Human-Computer Interaction (HCI) field, it has been proven that older users (from ages 45 and above) have a difficult time using touch devices such as mobile phones and tablets. [1] This could eventually reduce their ability to communicate or better yet stay connected to the rest of the world as technology continues to evolve. This thesis discusses the issues that older people face with gesture-interactive touch based devices and how a more intuitive touch based design for certain tasks on mobile phones as well as tablets can be implemented to help these users. The tasks that would be implemented to support this project include making calls, sending text messages, sending and receiving emails and surfing the web. The reasons for choosing these particular tasks is mainly because research shows that they are the most popular tasks carried out by both younger and older adults.

1.2 BACKGROUND

One aspect of technology that has been noticed is the evolution of mobile phones and tablets. For example, the introduction of *M-Pesa*; the mobile money transfer system in Kenya is one of the many ways in which mobile technology has evolved. Unfortunately, a lot of people do not understand the intricacies of this new way of life. This group of people can be likened to illiterate users as far as their knowledge of the workings of contemporary gadgets is concerned. Some are educated and can read and write but without the understanding of the technological lingo, their educational status has limited usefulness.

Mobile phones and tablets are used today to carry out most tasks; make calls, book appointments, make purchases, read books, watch movies, find out information on the Internet and generally to just stay connected to the rest of the world. Computer technology has become more of a lifestyle than merely a means of communication. We have come from the time of typewriters to the age of gesture interactive devices such as touch screen phones and tablets. However, as technology has evolved over the years, the generational gap that has been created now poses a problem as the older generation also known as the baby boomers (those born between 1946 and 1964) are finding it more difficult to keep up with the technological changes in the society. In order to let this portion of the world's population enjoy the same benefits as those who are technologically competent, specially adapted interfaces must be created. [2]

The phrases "older generation" and "older users" have been used a few times in this paper and so should be defined properly. The word generation according to the Oxford English Dictionary can be defined as "a group of people born and living at the same time, regarded collectively". According to Docampo Rama, a generation can be defined as "a range of birth cohorts that display similar behaviour and share norms and values that are based on common sociological environments during their formative years". [3] Generations have been grouped by different factors but in terms of Human Computer Interaction and for the sake of this project, the generations discussed will be classified as technology generations. The reason for this is mainly because it is assumed that "different technology generations behave

differently with respect to their different technology experiences in their formative period". [4] Rama went on to break down the cohorts born in the 20th century into two; those born before 1960, which he referred to as the electromechanical generation and those born after 1960, which he referred to as the software generation.

After defining the generations which will be concentrated on, it is important to know the major physiological and psychological factors that contribute to the issues older users have with technology

Sensation and Perception

- **Vision:** studies show that vision is the most cited reason for most problems when it comes to age. Physically, the reduction of pupil diameter in low light, the ability to focus on near objects, the reduced motion sensitivity and the ability to discern colours all play a major role in the older users' ability to handle certain aspects of new technology. Basically, if they can't see what they are doing, then they can't necessarily do anything.
- **Hearing:** although not as crucial as the vision factor, hearing can become an issue when designing systems that are based on auditory icons. This is because as a person gets older they begin to have problems with their hearing; certain high frequency sounds, background noises and the like might go unnoticed.

- **Touch:** this is probably the most important factor for this research because of the relationship it has to HCI. Tactile perception informs a user on location of fingers e.g. on a mouse and whether an action was successful e.g. click of button. It has been argued that tactile acuity (i.e. keenness to touch) is higher in younger adults than older adults thereby reducing tactile stimuli (i.e. response to touch). [5]

Cognition

- **Memory:** There are different types of memory mechanisms but for the sake of interface design, working memory is the only mechanism that will be considered. This is because during an interaction sequence, several chunks of information have to be maintained and integrated to successfully complete tasks. [6] This mechanism however is affected by age i.e. the amount of information that can be kept in memory at a time reduces with age.
- **Attention:** This is another type of cognitive mechanism. Similar to memory, attention has different types of mechanisms. It has been likened to mental focus and serious concentration. There are three attention mechanisms that are affected by age i.e. selective attention (the ability to focus on certain objects while suppressing others), divided attention (the ability to attend to several chunks of information simultaneously, also known as attentional capacity) and sustained attention (the ability to remain focused on a task over an extended period of time). Much research has been carried out on these mechanisms to prove their age-related deficits and therefore attention

has been said to be a key factor to consider when designing tasks and interfaces for older adults. [7]

Motor Control

- Motor control can be defined as the control of muscles. Like most body functions, the control of movement worsens with age. [8] Older adults become slower and less precise in carrying out movements. Factors in motor control that are affected by age include reduced movement speed, reduced movement accuracy and reduced movement coordination. All these reemphasise the fact that certain movements will be difficult to carry out by older adults, for example, having total control of a mouse.

Below is a table showing the characteristics of ageing and their effects on the individual.

CHARACTERISTICS OF AGEING			
Perceptual	Psychomotor	Cognitive	Physical
↓	↓	↓	↓
Vision and hearing decline.	Slowness and imprecision in motor control.	Decline in working memory, divided attention and information processing speed.	Decrease in muscle strength and dexterity.

Fig 1.21: Figure showing summary of age related changes that have implications on interaction with technology. [9]

1.3 RESEARCH OBJECTIVES AND QUESTION

My thesis topic intends to focus on how the older generation relates to touch based devices. With the generational gap in technology, I want to:

- Investigate the way older users understand and relate to technology of this time by comparing how the younger generation also known as the millennials interact with the same devices.
- Research on how the formative years of each generation influence their behaviour towards technology.
- Determine the major factors that contribute to the inability of older users to properly use touch-based gesture interactive devices.
- Eventually come up with a solution that will help to bridge that gap, providing older users with a more enjoyable user experience.

The fundamental question this research will attempt to answer is: ***Does successfully designing a better interface for older people automatically mean it would be better for younger people? i.e. will the interface be as intuitive to younger people?*** To answer this question it is important to understand the different attributes that distinguish successful device interactions between older and younger users.

One major problem that has been a point of interest in the world of Human-Computer Interaction is the way interfaces are designed to please the user. Interface designers have a target market and therefore do not put into consideration the needs of other users outside this market. It is a problem that has contributed to the digital divide between the young and older users. Features like screen and font size, icons, spacing between buttons and

sometimes even the kinds of gestures used on the devices can be redesigned to alleviate technology use by the older users [10]

1.4 THEORETICAL FRAMEWORK

A large portion of my work is based on Stöbel's work on "Gestural Interfaces for Elderly Users- Help or Hindrance?" I plan to build on the results of his work by further experimenting ways to make certain tasks on touch-based gesture interactive devices more enjoyable for older users and subsequently help them better interact and carry out daily activities through technology.

1.5 METHODOLOGY

To gather data for the objectives stated above, information on what (i.e. the kind of tasks) older users use their devices for will be collected and analyzed. For example, I could analyze what daily tasks a businessman carries out on his iPad. To carry this out effectively, the subjects of this research will not only fill questionnaires but also be interviewed while they carry out the tasks they do regularly, verbally resounding their thought process in order to understand their difficulties as well as their ease in using the device. The questionnaire will also be structured to accommodate members in the target group who do not own such devices and reasons for them. Also the educational level of the individuals will play a part in their responses as this might determine their level of understanding.

1.6 SIGNIFICANCE

From the results and information gathered, the difficulties experienced by as well as general user experience needs of older users when using touch-based gesture interactive devices should be determined. Therefore, successfully

achieving the objectives should create a more enjoyable and intuitive user experience for older users.

1.7 LIMITATIONS

The data obtained in this research may not reflect an in-depth representation of what older users do with their devices as well as the difficulties they face. This is because the subjects might not be able to give a full account of their activities or how it affects them. Another limitation will be that of culture, as much as this project is focusing on older users as a whole, most of the participants in this study are from one cultural context and as such information received might be biased. Also, this particular project is limited to certain tasks and certain devices thereby not providing a full representation of the issues users face. Another reason is the fact difficulty levels will vary from user to user depending on frequency of use, age and other factors and hence the research at this point is being performed on a sample size that is statistically significant.

A more suitable approach will be for the researcher to carry out direct observations over a particular period of time including the interviews previously stated. This may probably give the researcher a more detailed understanding of how to increase user experience for older users.

1.8 OVERVIEW

This thesis comprises of related work on interface design for older users, a research methodology, data analysis and a conclusion.

- The related work section will look at existing works on designing interfaces for older users.

- The research methodology section will describe how the data needed for this study will be gathered.
- The data analysis section will analyze and present data gathered in order to help with final solution.
- The conclusion will not only answer the research question but also ensure that the objectives of this paper were met.

CHAPTER TWO

LITERATURE REVIEW

A considerable amount of work has been done in this particular section of Human-Computer Interaction. As technology evolves rapidly, scholars are becoming more and more interested in discovering what creates a unique user experience for users of all ages. In this chapter, analysis will be carried out on already written work on the issues faced by older users when using technological devices i.e. mobile phones and tablets. These works were found in peer-reviewed sources like journals, dissertations, thesis and other reputable sources. In order to analyse the works properly, the articles collected were read and categorized.

In the article "Technology generation and age in using layered user interfaces" by Docampo Rama et al, it is stated that the two factors which play a role in why older adults encounter more difficulties than younger persons do in using present electronic devices are (I) age-related decline in ability and (II) generation-related lack of earlier experience with such user interfaces. [11] They proposed that there are three factors which contribute to the difficulties in using modern-day products with extensive functionality; these factors include complexity of the user interface, age effects in perceptual, cognitive and motor abilities and generation-related lack of experience with such technology. They further discuss the issue that individuals are less likely to be affected by changes in attitudes, norms and values after young adulthood. It discusses three major styles which have

been identified to have changed within the 20th century; They include the mechanical style and the electro-mechanical style, with attributes such as push buttons and switches, which was predominant around the thirties and forties and the early eighties respectively and a software style with attributes such as displays, touch screens and wireless remote controls and which is still currently the most common style. The concept of technology generations, which was introduced by Sackmann and Weymann was discussed. Evidence was found that people who experienced the availability of the same types of consumer product during their formative period (period between adolescence and young adulthood) display similar technology usage years later so the different technology generations appear to behave differently with respect to technology experience. Therefore, it is safe to say that birth cohorts that have experienced electro-mechanical styles in their formative period can be expected to have more difficulties in learning to use software styles than the cohorts that experienced this style in their formative period. Docampo et al came to the conclusion that the main differences between generations was user strategy i.e. the software style generation were more prone to trial and error strategies of learning which the electro-mechanical generation were not comfortable with. They also discussed the fact that subjects above 75 years experienced more difficulty when dealing with interface layers that required working memory related to the perceptive, motor and cognitive aspects. They further advise that designing a software-type user interface for older users will be a challenging task.

Also, the article "On Some Aspects of Improving Mobile Applications for the Elderly" by Holzinger et al confronts designers and developers (especially the younger ones) with the problems faced daily by the elderly which are not easily understood. They propose that these users may not necessarily need just bigger, brighter virtual keyboards but rather focus on their motivation for and their past experiences in using mobile applications. Some of the problems of the elderly stated are cognition, motivation, physical impairments and perception. [12] Solutions that were created for these problems included simulation of cognitive and motivational impairments and simulation of physical and perceptual impairments. The former simulation which has significance in this thesis was created to help developers and designers understand the users affected from a psychological point of view. The simulation took an HCI approach to help reduce difficulties in using mobile applications. In an ideal situation, the system would offer less and less assistance as the user progresses. One other major design issue for the elderly that was discussed was the size of the target areas in order to use their fingers on touch screens. This issue will be closely investigated for the sake of this thesis as it is being considered to be included as part of this project's final solution. Although this article also investigated ways to make the lives of the elderly disabled easier using mobile applications and devices, only the sections relevant to this thesis were discussed.

The last article that will be discussed is Christian Stöbel's "Gestural Interfaces for Elderly Users - Help Or Hindrance?" As Stöbel makes a lot of reference to Docampo Rama, a large portion of his work discusses technological

generations like Rama's article the "Technology generation and age in using layered user interfaces" and so will not be repeated. However, he also discusses the issue of intuitive interfaces. The article describes an intuitive interface as one that should be easy to use, easy to learn, requires little to no previous knowledge and just feels "natural" in its use. [13] It states that it is more appropriate to talk about an intuitive use of a product, or an intuitive interaction rather than an intuitive product. This helps to create awareness for the designer when creating a final solution, since the problem this thesis is addressing as intuitiveness is a major factor. Gestural interfaces are said to be particularly intuitive because they tend to make reference to sensorimotor levels of prior knowledge e.g. touch and gesture, thereby making interfaces more intuitive. Stöbel also discusses the concept of participatory design which refers to a special approach towards designing technical systems in which the people who will use the system will play a crucial role in the design process. However, in this project, a user-centered design approach will be used i.e. A type or section of this concept will be implemented when usability tests are carried out and the participants are asked for feedback thereby using the users' knowledge to improve overall designs.

CHAPTER THREE

METHODOLOGY

To help enlighten me and provide better clarity to developing an intuitive interface for older users, I engaged in two research methods i.e. questionnaires and interviews (which include observation and prototype testing). The reason for using these methods is based on user-centered design. This design methodology states that users play an important factor in the design in any application or system. In this kind of methodology, users and designers work together to discover the wants and needs of the user and try to solve them accordingly. A qualitative approach was used for this project because it helped me understand the reasons why users do the things they do when it comes to their mobile devices. Understanding how older users use their mobile phones or tablets and why they use it the way they do is an important factor to consider when designing the interface. This is because it not only helps in discovering the difficulties they encounter but also shows what elements need to remain unchanged.

3.1 RESEARCH METHODOLOGY

In order to fully understand the problem being tackled and to study the usage of mobile phones and tablets by older users, a decision to use a case study (i.e. an analysis of the situation that will be used as a basis for drawing conclusions) as the research method was made. This is because "Case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research".[14] Considering the focus on older users,

individuals that suited these criteria were found and were used as part of the research process.

A questionnaire that allowed investigation of the different kinds of activities the targeted group carried out on their devices as well as problems they frequently encountered was prepared. Also taken into consideration were the individuals who did not use these devices but wanted to as their input provided insight into the influence these devices had on non-users as well.

Usability tests were also carried out. This involved a face-to-face meeting where the participant was asked to use either a mobile phone or a tablet to complete certain tasks e.g. sending an email. The participants were encouraged to voice out their thought process as they carried out the tasks and were assured that the sessions were not tests but merely processes to help solve a problem. The usability tests were recorded strictly for documentation purposes.

Within a period of three weeks from the second week of February to the first week of March, questionnaires were handed out and usability tests carried out. Places like East Legon, Osu, Dome and Accra, which are all within the Greater Accra region, were the areas of interest. The average amount of time for the usability tests was between 45 minutes to 1 hour.

Also, in order to monitor the progress of the applications as well as test the benchmark of the procedure that was carried out, a control group was created. The group consists of younger users within the age of 12 to 25 who

will be used to compare to the older users in order to validate the outcomes of the solution.

3.2. PARTICIPANTS

The intended sample size was a total number of 30 people spread evenly between both sexes. Each participant was asked to fill a questionnaire as well as sign a consent form to ensure that the participant was involved in the exercise voluntarily. Some of the challenges faced with using questionnaires were that the older adults felt they had to give certain kinds of answers to avoid looking ignorant.

In appendix A are some of the sample questions asked as well as the consent form used to attain participants' approval.

As part of the usability test, the participants were asked to carry out certain tasks on a tablet or a mobile phone while voicing out their various thought processes and then from the information gained, a mock-up version of the original solution will be created in order to test if all the users' requirements have been met and then revised to solve any issue.

CHAPTER 4

DATA ANALYSIS

4.1 INTERVIEW RESULTS

The interviews were carried out at different locations in the city of Accra, Ghana. 9 subjects (5 male, 4 female) were interviewed in Circle, Accra, an area in the city of Accra, 5 subjects (3 male, 2 female) were interviewed in Spintex, Accra, 1 subject (1 female) was interviewed in Teshie-Nungua and 2 subjects (1 male, 1 female) were interviewed in West Legon. All the locations mentioned above are all situated in the city of Accra. The subjects, under the supervision of the interviewer, answered questions and gave comments and feedback afterwards.

A number of the interviewees had difficulty answering the questions which was attributed to the use of technical language such as 'Smartphone' or 'tablet'. Some of them who although owned the devices being asked about responded negatively when asked as they did not know the term used to identify said device. On the other hand, some of the interviewees who knew they had Smartphones were only accustomed to using the device for calling and sending text messages.

One major problem encountered was the need to explain certain questions multiple times. Questions like what challenges did users experience with their device was interpreted in different ways and so had a wide range of answers. Also, users associated features like short battery life and lack of network to bad experiences when using their gadgets. Although, these issues are valid,

it was challenging explaining the kind of experience that was being inquired i.e. experiences like texting issues, making calls, browsing, etc.

Even though a number of the subjects interviewed were very educated and were involved in white collar jobs e.g. Banking, Secretarial services, consultancy, engineering, etc, they either did not know what a Smartphone was or they had one but didn't know how to efficiently use it.

4.2 EXPECTATIONS OF AN INTUITIVE APPLICATION

After providing a detailed explanation of what the proposed application was supposed to do, the interviewees gave a range of expectations for the application. Although some of these expectations were personalized and only took care of that particular individual's needs, the general feedback included:

- Bigger phones i.e. bigger screen and bigger buttons because it could be difficult to see what they were doing at times.
- Guides/ Instructions on how to use the applications on the device.

4.3 USABILITY TEST RESULTS

In carrying out the usability test, suitable testing materials were chosen prior to the tests. The materials/ gadgets used for this project were an iPad 3, an iPhone 4S and an HTC android phone. These gadgets were chosen in particular due to different benefits they all possessed. For the iPad and iPhone, the interface which is seen to be quite intuitive made it a helpful device for testing as navigating through screens was easy. Also, with the android phone, the fact that it is widely used makes it a suitable testing device as users will be familiar with the interface. The tests involved using

gadgets to test making calls, sending text messages, sending/ receiving emails and browsing the Internet. The test was taken at two different locations i.e. Spintex and West Legon both situated in Accra. All tests were carried out by the interviewee with the help of an interpreter in cases where the local language was a barrier. Findings discovered include having to zoom in and out in situations where the screen size posed a problem, and having to explain icons and what the application itself did; however, it was later realized that the subjects were more open to learning about how the application worked before actually testing it.

The process of carrying out the usability test went as follows:

- The participant was asked to carry out a certain task e.g. sending an email on a gadget voicing out his/ her thought process as he/she went along.
- If unsure of a certain move, the participant asked for directions. The interviewer in turn asks the participant for what his/her opinion is on what the next move should be thereby getting clearer insight on what users deem intuitive.

Overall, the most successful task (rated by ease in carrying out and completion of task) to be completed on all devices was the task of making calls, followed by sending text messages. The process of sending emails and browsing the Internet were not as successful as some participants didn't even have email addresses (although aware of it) and the ones who did were used to carrying out the procedure on one particular device, theirs to be

precise. This was discovered when two subjects were able to take me through the process on their devices but couldn't do the same on the devices provided.

4.4 LIMITATIONS

A number of limitations came up with this project; some of them were foreseen while others were not. The challenges experienced include:

- Finding subjects to interview (i.e. individuals aged 55 and above) posed a challenge as some of them were inaccessible due to geographical locations, some did not trust what the interviews were about and others were not available for lengthy conversations due to health reasons, etc.
- The interviews that were carried out took longer than expected (i.e. within 1 hour and 90 minutes) as the interviewees wanted to establish a personal relationship before answering any questions.
- Certain technological lingo like "Smartphone" had to be explained.
- A handful of the subjects shied away from being involved in the usability tests aspects of the interview due to factors like lack of knowledge of devices, lack of trust for these devices, etc.

CHAPTER 5

PROPOSED SOLUTION

From research carried out, it is safe to say that a solution that will take care of the needs of older users needs to be introduced. Although there have been a few attempts that have been made to help solve this issue, this thesis seeks to provide another solution, one that will be designed specifically to bring an intuitiveness to using gadgets again. The prototype that will be designed will help older users perform the aforementioned tasks comfortably and more effectively.

5.1 PERSONA

Yaw is a 65 year old grandfather. Recently retired, He spends most days playing golf and reading about different holiday destinations. On weekends, he goes walking on the beach with his wife, Caroline.

Although generally healthy, Yaw has begun to have difficulty with his eyesight, but struggles to accept it. He has reading glasses but doesn't like to use it often.

Yaw doesn't see himself as old, particularly as his children tend to spoil him with gifts such as gadgets and clothes that are considered "in-style". In fact, a month ago, one of his sons got him a new Smartphone for his birthday.

5.2 SCENARIOS

Scenario A (Making Calls Task)

Once in a month Yaw likes to call up his family members and find out how they are doing. He usually has them on speed dial and knows which number

on the keypad represents which child or grandchild. Due to random moments of his phone freezing while in use, his cell phone was reset and so he needs to know the procedure to go through to make his calls. Being unfamiliar with the cell phone, he has difficulties doing this.

Scenario B (Sending & Receiving Messages Task)

After seeing the ads on television, Yaw registered for a service and started to receive text messages about his bank transactions. Once again, being unfamiliar with the cell phone, his main problem is he never knows when a message is sent and although he hears the message tone indicating new messages, he doesn't know how to view them.

Scenario C (Sending & Receiving Emails Task)

After reading about so many holiday destinations, Yaw finally decided to take Caroline on a 2 week cruise but he wants to be able to keep in touch with the daily running of his bookstore. His daughter manages it and has told him she will send him daily emails keeping him informed. Yaw however has never had an email address and so doesn't know how it works. He needs to get an application that can help him communicate through an email address and teach him about how it works.

Scenario D (Internet Browsing Task)

Being retired, Yaw is entitled to a monthly pension. Due to governmental issues, he doesn't get his pension on time. After a few fruitless trips back and forth to the pension office, he decided to find a way he can get the information about his pension before leaving his home. He knows he can find

the information online but he is looking for an easier way to be able to browse for the information he needs.

5.3 PROTOTYPE TESTING

The prototypes created (see Appendix D) were designed to try to solve the issues that were addressed in the scenarios above. In order to test its effectiveness, three in the target age group subjects (ages 58 and 62), chosen randomly were asked to test the prototype. After the testing of the prototypes, the users had feedback which has been broken down below;

Simple Design: All three users commented on the simplicity of the interface, stating that it was less confusing and easy to navigate. Finding a specific function i.e. sending a text message was found to be intuitive. In this respect, it is safe to say the major objective for this project was achieved as older users as well as the control group used were able to use this prototype with little or no help from the interviewer.

Soft Keys & Multi-Tap: Before the creation of the prototypes, the initial deduction from data gathered was that older users were more comfortable with soft keys or multi-tap buttons. However, during prototype testing, it was discovered that the users got confused between which keys required a long or short press and which keys required soft taps. Although, two out of the three users eventually figured out the way the keys worked, it is recommended that the use of a stylus will be most productive. This theory was not tested but is likely to work as using a stylus is like writing which is intuitive.

Keypad: In the prototypes created, the QWERTY keypad was dropped and alphabets were arranged in their known order i.e. "ABC". This increased speed in texting as the users did not need to search for the appropriate keys for too long. However, it was suggested that there be an option to choose which kind of keypad to use in order to also cater for the needs of the users who had become accustomed to the QWERTY keypad.

Awareness and Aesthetics: Another successful implementation in the prototypes was the awareness and attractiveness. The users were impressed with the fact the screens were aesthetically pleasing particularly the fact that the colours used made the screen captivating. Also, the lack of too much text and extra features made the experience enjoyable.

Making Calls Task: An important discovery was made while testing the making calls task on the prototype. All the users suggested in one way or the other that they would be interested in seeing the person they were calling e.g. like Skype or Apple's face time application. They suggested that this would make them more comfortable as they were used to face-to-face communication.

Browsing Task: When using this feature, users who were familiar with the Internet found the new design quite easy to use, however it was still a challenge for users who did not have prior experience with the Internet. Hence it is recommended that a sort of short tutorial be implemented to help them step through the process.

CHAPTER 6

CONCLUSION

Although this project focused on a small number of people in the Greater Accra region, the data gained from interviews and usability tests gave an idea on the usage of Smartphones and tablets by older users and their various needs to improve their user experience. This is mainly because the subjects were randomly selected from different places and have different backgrounds.

The different activities that were focused on in this project were used to test the users' ability on his/ her device. These various activities helped the designer understand the device from the user's perspective as well as show the current comfort level of the user with the device.

The data analysis section of this project discusses the ease as well as the difficulties experienced by some of the older users with their devices. One major problem encountered was the issue of current gadgets having small font sizes. Another problem was the user needing a step-by-step instruction on how to use certain applications on the phone. An interesting discovery was that most of these users got these devices (i.e. Smartphones or tablets) either as gifts or bought them because it was considered "in style". Also, it was important that the designer of the proposed solution understood what the particular needs of the users are, hence the creation of the persona and scenarios in the proposed solution section.

Using suggestions gotten from usability tests as well as interviews, the major inputs that were made to the applications were

- Bigger buttons on touch keypad,
- Bigger font sizes and
- A simpler navigation system that would be self-explanatory (this was implemented by using simple back and forward buttons that would help the user go through his/her device without getting overwhelmed).

After prototypes were designed, the feedback received was overwhelming and informative. The users who tested the prototype were impressed with the outcome. Some changes were required to produce an optimal design but the general consensus was positive.

The limitations encountered in this research were mainly due to the limited access to the target group. The solution in this project was designed based on the information gathered from the user, however certain features discussed in section 5.3 can be improved upon. Also, this project only proposed a design for the problem specified; therefore it can be implemented as an application that can be deployed on all mobile operating systems.

From the research carried out and users' feedback (both target group and control group), it is of my opinion that this project was successful and if implemented will help the users in question.

REFERENCES

- [1] C.Nordberg, "Exploring the text free interface for illiterate users: Designing an icon-based prototype for mobile phones," B.Sc thesis, University of Bergen, Bergen, Norway, 2012.
- [2] C.Nordberg, "Exploring the text free interface for illiterate users: Designing an icon-based prototype for mobile phones," B.Sc. thesis, University of Bergen, Bergen, Norway, 2012.
- [3] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany,2012.
- [4] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany,2012.
- [5] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany,2012.
- [6] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany,2012.
- [7] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany,2012.
- [8] C. Stöbel, "Gestural Interfaces For Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany, 2012.
- [9] N.Caprani, N.E. O'Connor and C.Gurrin "Touch Screens for the Older User," in Assistive Technologies,In-Tech Open Access Publisher, 2012, 95-118.
- [10] C. Stöbel, "Gestural Interfaces for Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany, 2012.
- [11] M.D. Rama, H.de Ridder and H.Bouma, " Technology generation and Age in using layered user interfaces," www.gerontechjournal.net, vol. 1, no. 1, p.25-40, September 2001[Online].

[12] A.Holzinger, G.Searle and A.Nischelwitzer "On some aspects of improving mobile applications for the elderly" in Universal Access in Human Computer Interaction. Coping with Diversity, Springer Berlin Heidelberg, 2007, 923-932.

[13] C. Stöbel, "Gestural Interfaces for Elderly Users: Help Or Hindrance?," PhD dissertation, Technical University of Berlin, Berlin, Germany, 2012.

[14]S.K. Soy, "The case study as a research method," 1997[Online] Available: <https://www.ischool.utexas.edu/~ssoy/usesusers/l391d1b.htm>

APPENDIX

APPENDIX A

Interview Questions

1. What age group do you fall under?
 - (a) Between 55 and 60
 - (b) 65 and above
2. Do you have children?
3. What is/ was your occupation?
4. Do you own a Smartphone or tablet?
5. Did you buy your gadget?
6. When do you usually use your gadget?
7. Can you tell me about your experience with gadgets?
8. In a day, how many hours do you spend on your gadget?
9. What are the top three activities you use your device(s) for?
10. Which of these activities are related to your occupation?
11. How would you describe your comfort level using these device(s)?
12. Do you experience any challenges when using your gadget?
13. What kind of challenges?
14. What is the biggest technological change you've seen in your life?
15. How often do you use the Internet?
 - Everyday
 - Once a week
 - Once a month
 - Hardly (quarterly ...)
 - Never used Internet

16. Do you access the Internet on a cell phone, tablet or other mobile handheld device?

- Cell phone
- Tablet
- Other (Specify)_____

17. Do you send or receive email?

- Everyday
- Once a week
- Once a month
- Hardly (quarterly ...)
- Never sent or received email

18. What is the main reason for owning your gadget?

19. Are you satisfied with your gadget? Why?

20. What do you think can improve your experience with your gadget?

People who did not own either of the devices where asked different questions

1. Would you like to own a device?
2. If no, why not?
3. If yes, which one and why?
4. What would you use the device for?

APPENDIX B

Consent Form

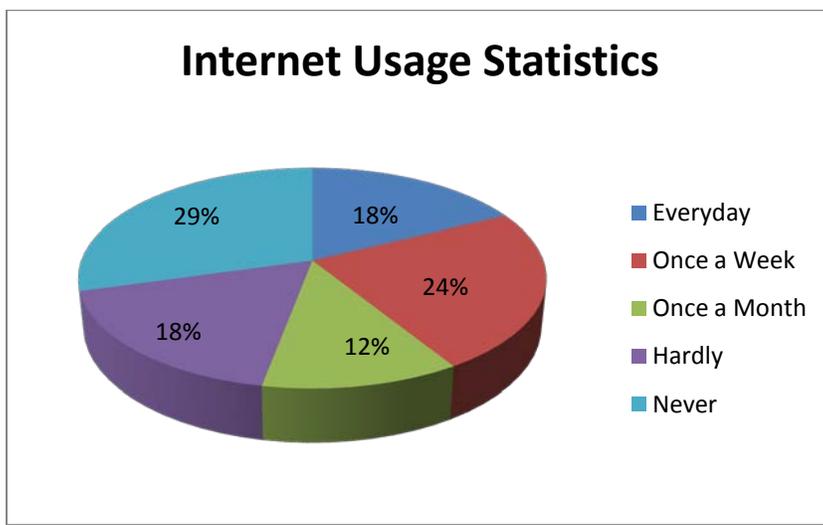
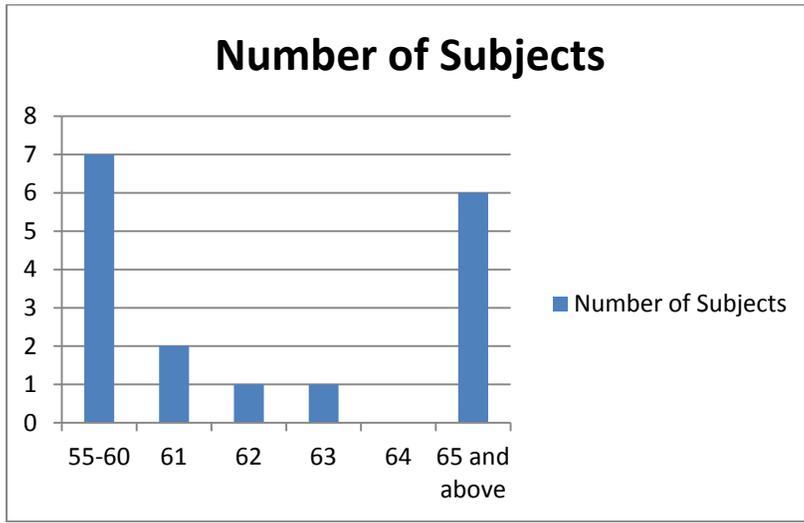
This consent form is to ensure that you the participant of this test is aware of the procedure that is about to be carried out. Please be reminded that this is not a test, there are no right or wrong answers, simply do what you think should be done.

I, a participant of this usability test agree that I am voluntarily partaking in this procedure. I have not been forced or promised an incentive to take part in this.

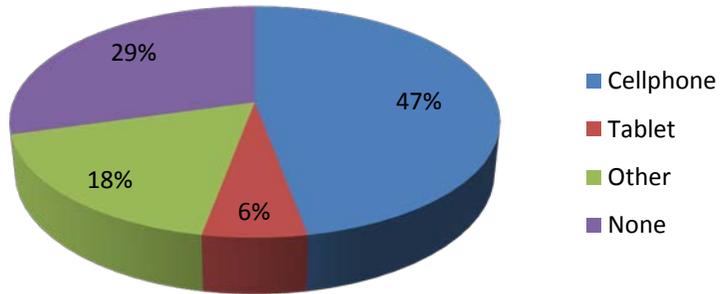
(Participant's Signature)

(Interviewer's Signature)

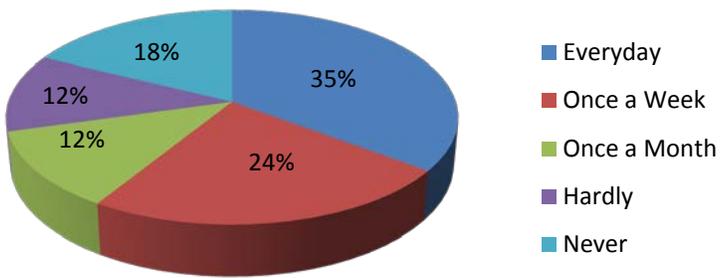
APPENDIX C
RESPONSE STATISTICS



Internet Access on Devices



Email Usage



APPENDIX D

To view this mock-up online, put this link in your browser:

<http://goo.gl/mMVh5z>

DESIGN MOCKUPS

